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Abstract

The Children's Museum in Boston developed MATCH Boxes (Materials and Activities for Teachers and Children) to provide self-contained, multi-media kits for elementary school use. The project sought to determine an optimum balance of activities and various media which would involve the student directly in the learning process and would make use of the vast amount of learning potential which is non-verbal in character. A total of 114 boxes on 16 topics, largely in the social sciences, were assembled. Each box contained enough real objects, filmstrips, pictures, games, and supplies for 30 students to investigate the topics for two to three weeks. A teacher's guide offered lesson plans and information about the materials with the purpose of helping the teacher to pattern a three-way encounter between herself, the children, and the materials. The boxes were developed by teams of subject matter specialists, teachers, artists, and technicians over a period of four years. Three generations of boxes were evaluated. The teachers participating in the testing phase were asked to make a daily and an overall appraisal of the materials. Random visits by observers provided more information about the usefulness of the boxes. A second volume of the report contains analysis and evaluation of the project. This document previously

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FINAL REPORT
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VOLUME I

MATERIALS AND ACTIVITIES FOR TEACHERS AND CHILDREN: A PROJECT TO DEVELOP AND EVALUATE MULTI-MEDIA KITS FOR ELEMENTARY SCHOOLS

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MATERIALS AND ACTIVITIES FOR TEACHERS AND CHILDREN: A PROJECT TO DEVELOP AND EVALUATE MULTI-MEDIA KITS FOR ELEMENTARY SCHOOLS

Frederick H. Kresse
The Children's Museum
May 1968

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Paul Fishman	(Music)
Ruth Green	(City, Medieval)
Susan Williams Green	(Imagination)
Erma Hirschfeld	(Waterplay)
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Summary

SUMMARY

This report describes a four-year project conducted by the Children's Museum of Boston to demonstrate and explore the characteristics of self-contained, multi-media kits designed to enable elementary teachers and children to communicate by non-verbal means.

The project's premise was that words are very limited as mediators of learning, particularly at the elementary level, and that objects and activities are needed in great variety to expand and improve the learning of many subjects.

A total of 16 units, called MATCH Boxes, were developed and tested. A MATCH Box is a system of materials and activities programmed and activated through a Teacher's Guide. The materials consist primarily of real objects combined with films and projectors, pictures, recordings, models, maps, and books. The activities emphasize the child as the agent of his own learning. Each MATCH Box contains enough materials for a class of 30 children to use for two or three weeks, and the units are designed to circulate from class to class.

MATCH Boxes - some in science, but most in social studies - were developed by teams of project staff members, subject matter and teaching consultants. As they were being developed they were tried out in schools. Once prototypes were finished they were evaluated in a wide variety of school systems.

Teachers and children were overwhelmingly enthusiastic about the units and this form of teaching. Teachers judged class interest, attention, participation and learning to be greater than usual. They were delighted to have such rich materials to work with. Previously unresponsive children participated, often for the first time. Many children surprised their teachers by what they could do. The units altered the relationship between teacher and children making it more collaborative rather than teacher-led. Teachers felt they knew what the children were learning from behavior they observed and therefore didn't need special tests.

The report concludes that mediating systems such as MATCH Boxes offer a practical way to bring about exciting, more meaningful and lasting, and personally rewarding learning experiences. The report envisions the development of such systems in other forms, on other subjects, and in other applications.

Introduction

INTRODUCTION

On May 19, 1964, The Children's Museum of Boston proposed a project to the U.S. Office of Education:

> "The Problem:
>
> "Much of learning is non-verbal. Instead of being mediated by words it is mediated by things. Because they lack time and money, most teachers--even the ones in over-privileged schools--do not possess the vocabulary of things they need to communicate effectively with their pupils. And so certain crucial experiences never occur in the classroom, others occur only partially, while still others are so abstracted that distortion sets in. The result is that some things are not learned at all, others only superficially, and some are probably mis-learned. This lack of appropriate media with which to convey knowledge and to develop skills and attitudes is particularly acute at the elementary level where the proportion of non-verbal learning is high.
>
> "A non-verbal fact, such as the warmth felt in an Eskimo parka, may be conveyed by a single object or medium--in this case the parka. But patterns of media and activities are usually required to communicate non-verbal principles, concepts and relationships. For example: to convey a real sense of Navajo life may require a film, various artifacts, recordings, and activities for children to engage in. Though many media are recognized as valuable in furthering the dialogue between teacher and learner, very little is known about how to combine them for this purpose.
>
> "The problem, then, is to find out how to combine media in a way that will permit teachers and students to communicate with each other on topics having a high proportion of non-verbal content. This project is directed at solving this problem. It proposes to do so through the systematic development and evaluation of a series of multi-media kits of teaching/learning materials designed for the elementary grades.

> "But there is another problem. Even when one knows what media to use to teach a certain topic, there remains the problem of getting them into the classroom when they are needed. The solution to this problem lies in the establishment and operation of media libraries from which kits of curriculum matched materials can be borrowed. Museums, in general, are well suited to perform this function."

The approach consisted of developing and evaluating a series of self contained, multi-media kits in elementary social studies and science. Each kit was to be an experiment that probed the realm of non-verbal learning. The kits were to be made in distinct groups, or generations, to permit the conception and design of such kits to be adequately explored and developed.

The kits were called "MATCH" Boxes, the name being derived from the project title, Materials and Activities for Teachers and CHildren.

MATCH Boxes now exist. Hundreds of teachers have taught with them, and thousands of children have learned with them.

A MATCH Box is a system of materials and activities designed to establish communication between a teacher and her class on a subject that cannot be communicated very well with words. The Box contains all sorts of real objects, as well as films, pictures, games, recordings, projectors, and supplies. There is a Teacher's Guide that activates the three-way encounter between the teacher and the children and the Box.

MATCH Boxes treat a subject quite intensively over two or three weeks, and they contain practically everything that a class of 30 children will need to work with during that time.

The Boxes come in all different sizes and shapes, and are generally packaged in two carrying cases which, in all, may weigh from 40 to 80 pounds. The Boxes are meant to be circulated to teachers through materials resource centers, libraries, A-V departments, and museums. One Box can easily be used by 10 classes during a school year, and perhaps by as many 15.

In all, 114 Boxes have been produced on 16 different topics.

This report describes how the MATCH Box Project was conducted, how MATCH Boxes were made, what they are like, how they were evaluated, what teachers and children thought of them, what we think of them, and what we see as future possibilities for mediating systems of this kind.

Project History

July, 1964	Project began.
September, 1965	First Generation Boxes
Grouping Birds	K - 2
The City	1 - 3
The Algonquins	3, 4
Seeds	3, 4
A House of Ancient Greece	5, 6
September, 1966	Second Generation Boxes
Houses	1 - 3
Animal Camouflage	2, 3
Netsilik Eskimos	3, 4
Musical Shapes and Sounds	3, 4
Rocks	5, 6
Japanese Family 1966	5, 6
Medieval People	5, 6
September, 1967	Third Generation Boxes
Waterplay	Nursery - 2
Imagination Unlimited	3, 4
"Paddle-to-the-Sea"	4 - 6
The MATCH Box Press	5, 6
May, 1968	Project completed.

Methods

METHODS

The overall strategy of the project consisted of developing and evaluating three distinct "generations" of MATCH Boxes. By this strategy we sought to evolve a conception of the MATCH Box form, to establish methods for making MATCH Boxes, and to find out how and why they work in the classroom.

A. General Project Plans and Methods

Project Plan Figure 1 below shows the overall plan of the project. There were three overlapping phases each consisting of a complete life cycle in which a "generation" of MATCH Boxes was developed and evaluated.

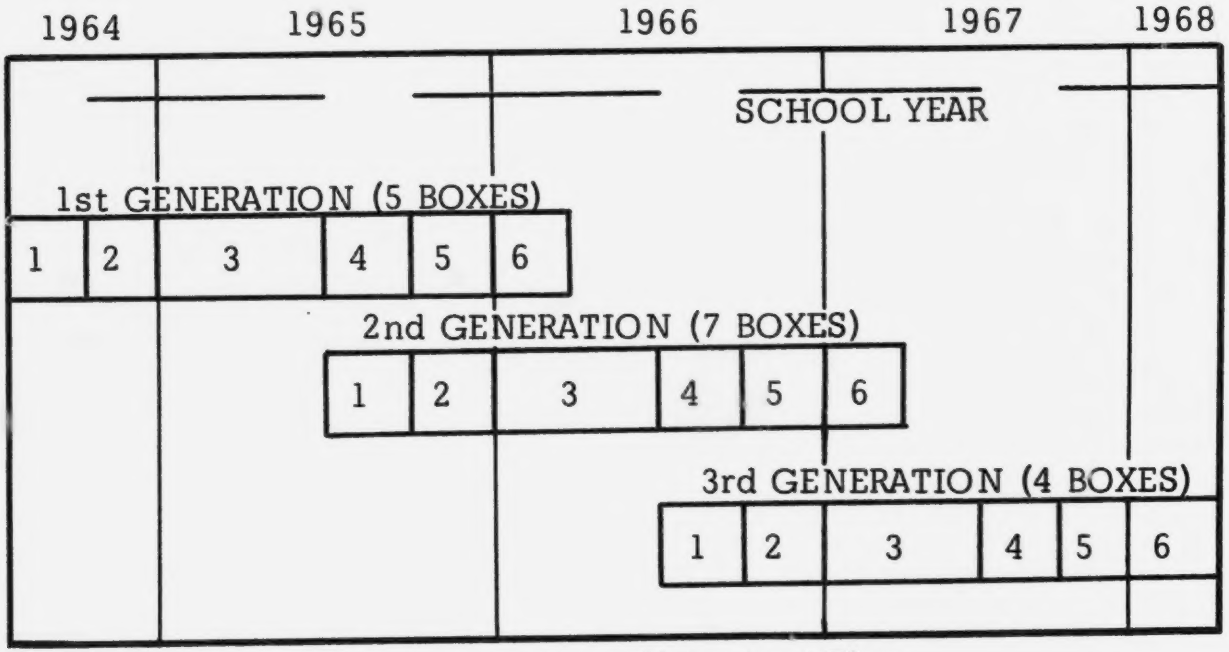

1964
1965
1966
1967
1968
SCHOOL YEAR
1st GENERATION (5 BOXES)
1
2
3
4
5
6
2nd GENERATION (7 BOXES)
1
2
3
4
5
6
3rd GENERATION (4 BOXES)
1
2
3
4
5
6

Figure 1 Overall Project Plan

The life cycle for each generation was approximately 21 months long and divided into 6 stages:

1. Topic Selection and Box conception (3 months)
2. Early Research and Development (3 months)
3. Tryouts and Revision of materials and activities (6 months)
4. Final Development and Production of the prototype kits (3 months)
5. Evaluation in schools (3 months)
6. Data Analysis and Box Appraisal (3 months)

The cycles were planned so that early development, tryouts, and evaluation fell during the school year, while final development and production took place during the summer months.

Each generation of Boxes had an overriding purpose. The First Generation was used to explore a wide variety of topics and media problems, to establish development and testing methods, and generally to find out what it is like to make MATCH Boxes. The Second Generation was used to consolidate ideas, refine techniques and pursue interesting aspects of what we had learned from the first Boxes. In the Third Generation we had planned to manipulate specific media-combining variables, but these Boxes were used mainly to further probe and extend the range of MATCH Box possibilities.

The project ran for 47 months. During the last two months (not shown in Figure 1) individual Box reports were completed, and the Final Report was written.

Team Approach: Each MATCH Box was developed by a team that was organized and led by pairs of project staff members termed co-leaders. The co-leaders had their own development budgets for materials and consultants, and were quite autonomous. (General project objectives, policies, and procedures, were established by the project staff as a whole.) Working with the co-leaders on the development team were various consultants: subject matter specialists, teachers, artists and technicians.

A team was formed after we had arrived at a general Box conception. At the outset each team worked to refine this conception, and give it specific form in terms of defined Box objectives, media and activities. During this period the teams met about once a week. When materials and lessons were being tried out in classrooms, team meetings became fewer, and hardly any were held once the box was in production. At this stage the co-leaders were coordinating the work of the many suppliers, designers, and craftsmen who were actually executing the Box.

Role of the Co-leader: The co-leader's role was extremely complex, combining many functions. Co-leaders were responsible for:

- the original conception of the Box
- forming a development team and managing its operations
- technical and educational integrity of the Box
- planning and organizing work on the Box
- budgeting material and consultant costs
- finding suppliers of materials, specifying and ordering materials
- arranging and conducting tryouts
- writing the Teacher's Guide

- supervising production of the Box
- preparing special questionnaires
- observing and evaluating Boxes
- analyzing and interpreting data
- writing a final report on each Box

The Status Matrix (See Figure 2.): This device was proposed as a Box development tool. It offered a way of representing the Box at any point in its development in terms of its objectives and the media and activities to be used in achieving them. The matrix took the form of a large "status board" on which the teams could work.

"Working" the matrix involved working out interrelationships between entries in the various columns. Initial entries in the matrix showed the Box as first conceived. During development, entries were rearranged, discarded, and new ones introduced. Whole columns might change. Whole rows might be removed or replaced. As more and more of the interrelationships between media and activities and objectives were worked out, the pattern of the prototype kit emerged.

The matrix was intended to serve a number of functions:

1. to help teams keep track of what they had done
2. to reveal choice points, alternatives to be considered, information gaps and problem areas
3. to provide members of the development team with a common referant and focal point for their efforts
4. to make the assumptions, choices and intentions of the kit developers explicit

Objectives	Media	Activities	Supplies	Equipment	Instructions	References	Package
HOW TO WORSHIP AT A JAPANESE BUDDHIST ALTAR — LIGHT INCENSE, RING BELL, SAY PRAYER	STATUE OF BUDDHA, ANCESTOR TABLET, BELL, INCENSE POT, INSTRUCTION CHART	MAKE CARDBOARD BOX ALTAR, ARRANGE INSIDE, RING BELL, LIGHT INCENSE, SAY PRAYER.	INCENSE STICKS		SEE FAMILY GUIDES & INSTRUCTION CHARTS, USED BY CHILDREN–TEACHER SHOULD CONSULT THESE	FAMILY HISTORY	PLASTIC BOX
LEARN TO EAT WITH CHOPSTICKS & PROPER TABLE MANNERS	CHOPSTICKS, 3 DISHES, FAKE FOOD, SEAWEED SPRINKLES, FILM LOOP	PRACTICE EATING WITH CHOPSTICKS, SIT PROPERLY AT TABLE, WATCH FILM LOOP OF PEOPLE EATING	COOKED RICE	FILM LOOP PROJECTOR	SEE FAMILY GUIDES & INSTRUCTION CHARTS USED BY CHILDREN–TEACHER SHOULD CONSULT THESE	FAMILY HISTORY	PLASTIC BOX

Figure 2. Status Matrix filled in with an example from "Japanese Family 1966"

B. Box Development and Evaluation Methods

This section describes the methods used at each stage in the life cycle.

STAGE 1 - TOPIC SELECTION

Ideas for Boxes were generated, discussed and examined; background research was conducted, curricula studied, subject matter specialists consulted, etc. Box conceptions were subjected to critical staff review. Two staff members committed themselves to developing the Box.

Deciding what Boxes to undertake involved trading many factors off against each other. This took many staff meetings spread over two to three months. Certain general criteria were used in choosing all of the Box topics and there were others that characterized the individual generations.

In general we sought topics

- that had relevance to the elementary curriculum
- that implied a variety of media
- that suggested the use of real objects
- that suggested worthwhile and interesting activities for the children
- that would be feasible to use in an ordinary elementary classroom
- that would work for even the less-than-average teacher
- that would be portable and loanable and not pose insurmountable maintenance problems
- that required 2-3 weeks of class time
- that could probably be developed with the time and resources we had available
- that were of interest to the staff and to which a pair of co-leaders would commit themselves

Special criteria modulated the selection process in each generation.

First Generation - Selection Criteria and Topics

An overriding consideration was to choose Boxes that as a group would be quite diverse in topic, grade level, approach and types of media. This way we thought we would get the most experience and best overall sense of both the potential and the problems associated with MATCH Boxes.

We also wanted the topics to offer the possibility of developing related boxes later on. In our original proposal we planned a shorter project in which we expected to develop 16 kits in two years and in two generations. We expected to derive the Second Generation topics from the first ones chosen, thereby conserving research and developmental effort. We soon learned that it took more to make MATCH Boxes than we had thought. As a result the project was extended, and the Box topics of each generation wound up being chosen quite independently of each other.

Topics, First Generation	Grade Level
Grouping Birds	K-2
The City	1-3
Seeds	3,4
The Algonquins	3,4
Greek Man (later became "A House of Ancient Greece")	5,6

Second Generation - Selection Criteria and Topics

While the First Generation topics were chosen in a series of informal staff meetings, selection of the Second Generation topics was done more systematically using a Criteria List that reflected our emerging conception of MATCH Boxes as such, and the Project as a whole. Seven topics were chosen from an initial list of 150 ideas. After the field had been narrowed by the staff as a whole, staff members interested in particular topics would present and defend these to the staff. The proposed Box would be discussed, critiqued, and finally rated on the pre-established criteria. Boxes that met most of the criteria were cleared for development. Topics with apparent weaknesses were either dropped or presented again with modification.

The complete Criteria List developed and used at this time is found in Appendix A. In choosing Second Generation Boxes, less emphasis was placed on topics that existed, as such, in the curriculum. We felt that some innovative topics were also in order. There was also more concern now with how the teacher would relate to the unit, and the kinds of activities that the Box implied for the children entered as a strong factor.

And a new criterion - elegance - became important. An elegant Box was one in which the proposed objectives, media, and activities held together in a believable conception. It would be simple, direct, and uncontrived.

Preference was given to social studies topics. Our staff was more qualified and interested in working in this field, and it was clear that materials and innovative approaches were more urgently needed in social studies than in science.

Topics, Second Generation	Grade Level
Houses	1-3
Animal Camouflage	2,3
Netsilik Eskimos	3,4
Musical Shapes & Sounds	3,4
Rocks	5,6
Japanese Festival of O'Bon (later became Japanese Family 1966)	5,6
Medieval People	5,6

Third Generation - Selection Criteria and Topics

The criteria used in choosing the last Boxes were much the same as those used previously, but they were not applied as rigorously. We relied heavily on experience and an internalized sense of the criteria to guide the selection.

It is also clear as we look back that we were not selecting topics so much as we were selecting Box conceptions whose details - including their names and even their exact objectives - would have to emerge in the developmental process. There was also a "last-fling" quality about choosing these Boxes. We wanted them to be quite unlike any that had been done before so as to probe as far as we could into the reaches of what a MATCH Box might be.

It was decided that the new Boxes could be designed for up to 3 weeks of use, yet they were to be simpler and cleaner in conception. (This was to compensate for the fact that the Second Generation Boxes had absorbed much more staff time than expected, so the Third Generation got off to a late start.)

Topics, Third Generation	Grade Level
Basic sensory experiences and skill development (later became "Waterplay")	Nursery-2
Poetry Box (later became "Imagination Unlimited")	2-4
MATCH Box Press	5,6
Hats (replaced by "Paddle-to-the-Sea")	4-6

Note: The Hat Box was abandoned when we ran into the problem of head lice. "Paddle-to-the-Sea" was conceived as a replacement in June 1967.

STAGE 2 EARLY RESEARCH AND DEVELOPMENT

At this stage the co-leaders interviewed subject-matter specialists, teachers and others, invited certain ones to work on the Box and so formed the development team. Team procedures and meetings were established. More extensive research was now undertaken into available films, pictures, filmstrips, books and sources for the real materials that might be used in the Box. Samples of materials were gathered, films previewed etc. Various elementary curricula were studied and compared.

The status matrix came into use at this point as the team worked to define and refine what the Box was to be about and how it would work. The push was to get some lesson ideas and materials ready to be tried out in the classrooms.

STAGE 3 TRYOUTS AND REVISION

The teams were encouraged to get beyond the study phase of the Box and into this next stage - classroom tryouts - as soon as possible. Tryouts were an integral part of the development process. They were used to test activity ideas, materials, the structure and organization of lessons, lesson sequences, classroom practicality, the attitudes and reactions of teachers and children.

Tryouts were spread over six months of the development cycle, typically from January through June. Trends during the period were from individual lessons to lesson sequences; from crude media or representations to the real thing; and from co-leader conducted classes to teacher conducted classes.

Tryouts were conducted in both public and private schools, the individual teams making their own arrangements. In general, once a class had been used to try either a single lesson or an entire sequence it was not used again.

STAGE 4 FINAL DEVELOPMENT AND PRODUCTION

During the summer months the MATCH Boxes were completed and produced. This was a period of intense activity which placed heavy demands on the co-leaders and also on the other Museum staff members and facilities which were now drawn into the Project.

When school let out and tryouts could no longer be conducted, there was still a lot to be done with each Box. None at this stage were ready to be produced. Final choices and decisions of many sorts had to be made. Some lessons had still not been worked out entirely.

During this stage then, design of the Boxes was completed, Teacher's Guides were written, edited, and printed; materials or components were specified and ordered; packaging designs were evolved for each Box and the packages made; graphics were designed; and finally the Boxes were assembled. The Boxes and many of the things in them were designed and built at the Museum. In all, 114 units were built on 16 different topics. Most units were packaged in 2 cases and weighed from 40 to 100 pounds.

Before the final production, only small portions of the Materials and Supplies budgets had been spent. With the summer these expenditures rose sharply.

At this time also plans were being made to evaluate the newly completed Boxes. This involved working out agreements with school systems, devising an overall evaluation plan, developing questionnaires and other forms, developing evaluation procedures and training people to use them.

Toward the end of September the Boxes were shown at a "sneak preview", and shortly thereafter went into evaluation.

STAGE 5 EVALUATION IN SCHOOLS

Each generation of Boxes was formally evaluated in the schools during the fall and winter following its completion. Evaluations were conducted in a diversified sample of school systems mostly near Boston with two notable exceptions - Salinas, California and Somerset, Pa. Teachers were the prime source of data on how the Boxes worked. Classroom observers were a secondary source. The general evaluation approach was the same for all three generations, but questionnaires and procedures varied.

The Evaluation Sample: The schools and teachers who participated were drawn from big city, industrial suburban, wealthy suburban and semi-rural school systems.

First Generation Sample:	Fall, 1965	88 teachers,	15-18 per Box
Boston, Mass.		6 schools	25 teachers
Framingham, Mass.		5 schools	15 teachers
Brookline, Mass.		4 schools	15 teachers
Newton, Mass.		3 schools	8 teachers
Cambridge, Mass.		2 schools	5 teachers
Concord, Mass.		4 schools	20 teachers

Second Generation Sample:	Fall, 1966	159 teachers,	18-22 per Box
Salinas, California		15 schools	53 teachers
Wellesley, Mass.		11 schools	25 teachers
Arlington, Mass.		9 schools	29 teachers
Boston, Mass.		8 schools	24 teachers
Lowell, Mass.		8 schools	28 teachers

Third Generation Sample:	Fall, 1967	83 teachers,	18-21 per Box
Somerset Co., Pa.		8 schools	48 teachers
Individual teachers from various Boston area towns and schools			35 teachers

Evaluation Instruments: Questionnaires and other data collection forms were devised by the staff. Different forms were developed and used in each of the three evaluations. Some of these forms, together with some examples of special instructions, etc., are found in Appendix B.

Five kinds of data were gathered:

from teachers
1. written questionnaires or logs concerning individual lessons
2. written Final Appraisals of the Box as a whole
3. verbal comments and reactions to the Box

from observers
4. written anecdotal records of their classroom observations
5. written summaries of their overall impressions

Teachers daily responses and final appraisals (1 and 2 above) constitute our main data and our analyses are based on these. The other three kinds of data were gathered sporadically and have been used to give depth and balance to the teacher data and to spot specific design improvements that the teacher might not have recognized.

Teachers were asked how well the Box suited the curriculum and the children's capabilities, what their own reactions were, how the children responded, what difficulties they encountered. They were asked to compare teaching with the MATCH Box to techniques that they were used to, to judge what the children got out of the experience, to suggest improvements, to comment on the evaluation itself.

Observers were asked to study the interplay of the materials, the teacher and the children, to attend to the entire situation.

No data were gathered directly from the children, though there are many vivid reports of their behavior from the teachers and observers.

How evaluations were conducted: Arrangements for the evaluations were made through the school administration, by a project staff member. Teachers either volunteered or were selected by a supervisor or principal. In two cases, at Somerset, Pa., and Salinas, California, the school system itself shouldered the responsibility of arranging evaluations, and supplying observers. In a few cases, teachers were briefed about the Boxes, before they used them. Typically, however, the evaluation procedure was explained in a letter.

Evaluation periods were set up in advance with teachers assigned to evaluate the Boxes during specific periods. Between evaluation periods the Boxes were brought back to the Museum for maintenance, replenishing etc. - what we have come to call "turnaround". (In Salinas and Somerset, turnaround was conducted by the system itself.)

Evaluation periods were either 2 or 3 weeks long depending on the time for which the Box had been designed. Teachers were asked to use the Boxes according to the Teacher's Guides - when this did not work or seem appropriate they were encouraged to make changes and adaptations and to report these.

Typically, teachers used the Box each day while they had it. On the average, this involved an hour of class time per day. After each day's use, the teacher would fill in her daily lesson questionnaire or log. At the end of the evaluation period she filled in a final appraisal form in which she assessed her entire experience with the Box.

Observers were pre-assigned to two or three classrooms which they would visit from 1-4 times during the evaluation period. Thus, they sampled the lessons in a Box. No observer observed the use of an entire Box. Furthermore, not every classroom was visited by an observer.

In a number of school systems, special "debriefing" sessions were organized about a month following the evaluation. Teachers were invited to discuss the Boxes, how they felt about them etc. In the Boston area and in Somerset, project staff members participated, while in Salinas the debriefings were conducted by the evaluation coordinator and sent to us on tape. Following the evaluation the teachers were sent letters of thanks, and in Third Generation certificates of recognition which might become part of their personal record.

STAGE 6 DATA ANALYSIS AND BOX APPRAISAL

After the Boxes had been evaluated, the data was analyzed and a report was prepared concerning each Box. In this report the Box was analyzed lesson by lesson and on an overall basis. These final Box reports were prepared by the individual co-leaders.

Data Analysis: When the Project was conceived, it was planned that there would be a special effort - independent of the development work - devoted to the overall task of evaluation planning, instrument development, data analysis etc. We were unsuccessful in organizing this as a separate function in the Project and so it was performed as a general function of the entire Project staff.

First Generation data was analyzed by the individual co-leaders as part of the task of preparing final Box reports. Data for the Second and Third Generation was first reduced before being turned over to the co-leaders for use in preparing their reports. Most of analyses were done with respect to particular Boxes; relatively few are devoted to cross-box comparison or generalization.

Data analyses were simple and of two basic types. For questions with fixed alternative answers, a tabulation was made and percentages calculated. Answers to open-ended questions were analyzed, coded, and grouped into categories. In this process very little was done to "reduce" what the teachers were saying to a set of general statements. Instead, we carried the teachers' actual phrases through the analysis.

Examples of the reduced data are found in Appendix C. You gan get a real feeling for how teachers responded to the Boxes by reading through this data.

Box Reports: The final reports prepared by the co-leaders analyze individual lessons and overall response to the Box. They also list recommended changes, and record sources of materials. These reports were written with two purposes (1) to record what the Box was about and what was learned from it and (2) to serve as a guide to anyone who might want to develop the Box further.

The complete Box Reports are part of the Project archives. Access to them can be arranged through the Museum. For this report we have included in Appendices D-1 through D-16 the first sections of all 16 reports which summarize the findings for each Box.

Wrap-up: This consisted of sorting through files and materials, setting up an individual Box archives with source list, master tapes, original artwork, etc. The Boxes themselves, together with spare parts and information concerning their contents and maintenance, were turned over to the Museum's School Services Department for direct circulation to schools. One set was placed in the Museum's"Workshop of Things", a media resource center for teachers, and one set was designated for use in demonstrations or workshops outside the Museum.

Results and Discussion

RESULTS AND DISCUSSION

This Project has produced objects and object lessons described and discussed in this section under six main headings:

A. The Individual Boxes: a brief description and assessment.

B. The MATCH Box: a description of general characteristics, design concepts, and evolutionary trends.

C. How Teachers and Children Responded: a presentation and discussion of data from the Teacher's Final Appraisal forms.

D. Other Outcomes: the influence of MATCH Boxes on Museum programs and services; and on other institutions; national distribution.

E. Project Plans and Methods: a description and discussion of how things worked.

F. Project Costs

A. The Individual Boxes

In all, 114 Boxes were produced on 16 different topics:

	Completed	Topics	Copies	Total Boxes
First Generation	Sept. '65	5	3	15
Second Generation	Sept. '66	7	9	63
Third Generation	Sept. '67	4	9	36
		16		114

These Boxes are all prototypes, made mainly in the Museum's own shop. After being evaluated in the schools, most of the Boxes were turned over to the Museum's School Services Department which now circulates them to schools in the Greater Boston area. Copies are also available for examination in the Museum's Workshop of Things, a resource center for teachers.

Brief Box descriptions are given below with a general comment on each. More detailed descriptions and evaluations are found in Appendices D-1 through D-16.

Each of the 16 Boxes is very distinct, with its own characteristics and personality. Each has been an experiment - an exploration of the possibilities within the MATCH Box conception of a self-contained multi-media system. Though each Box taught us a great deal, they differ in the degree of elegance that we see in them.

An elegant Box has an overall integrity of objectives, materials and activities; it is uncontrived and practical in the classroom; the activities are engaging, make learning the result of the child's own actions, and do not require undue direction from the teacher. There is a natural and dramatic structure to the lessons. Considering the Project as a whole, it is a Box that is innovative. The elegant Box is an ideal none of the Boxes attained, but some came closer than others.

To indicate how elegant we think the Boxes are we have rated them, using a star system - much the way the Mobil Oil Co. rates restaurants: (*) least elegant, (**) moderately elegant, and (***) most elegant.

FIRST GENERATION

* Grouping Birds (K-2) Appendix D-1

Objective: To teach young children the rudiments and purposes of classification by using birds as the things to be grouped and sorted.

Media: Nine mounted birds in plexiglass containers; film loops of the feeding and nesting habits of these birds; projector and screen; pictorial data cards; bird stickers; flash cards; reference and story books.

Characteristic Activities: Grouping and sorting games based initially on the physical characteristics of the birds and later focusing on their behavioral patterns; collecting behavioral information from film loops; and using it to assemble a data chart for each bird.

Comment: The relationships among the media (birds, data cards, loops, stickers) are especially well worked out in this Box. The idea of teaching classification by means of such multi-dimensional media as birds is an innovation. However, the teacher and children tend to learn more about birds than classification. That is, the media and activities did not lead directly to the stated objective. One is reminded of MacLuhan's phrase that the "medium is the message".

** The City (1-3) Appendix D-2

Objective: To introduce young children to the concept of "cityness" and to give them an appreciation for the relationship that exists between the cities men build and the lives they live in them.

Media: Many wooden model buildings used with a magnetic chalkboard; films on Chicago and Stockholm; record of city sounds; several books; 36 mounted photos of various aspects of city life; large aerial photo of Boston; etc.

Characteristic Activities: Creating a city with model buildings; using photos to make up a story about the city: making maps; role-playing in an accident situation; matching city sounds and images; analyzing aerial photograph; and solving city planning problems; etc.

Comment: This Box deals with a popular topic and offers an alternative to the community helpers approach. There are 17 relatively independent lessons for the teacher to draw from - some very ordinary, some quite engrossing. The magnetic model is versatile and useful, and the picture pool demonstrates how a picture set can be designed so that games of various sorts can be played with it. Lessons, however, require a good deal of verbal structuring by the teacher. It is not clear whether the relatively independent lessons "add up" to give children a reasonable image of what a city is. Probably too difficult for first graders.

** The Algonquins (3, 4) Appendix D-3

Objective: To teach about the life of the Algonquin Indians of Massachusetts and Rhode Island by showing how they lived their daily life, how they saw the natural world and themselves.

Media: Reproductions of Indian artifacts (clothing, arrowheads, string of wampum, squirrel medicine bag, pin and cup game); maps; photographs; record of Indian stories; film loops on arrow making; etc. Extensive background information on the Algonquins is also included.

Characteristic Activities: Scraping dried deerskins; hafting an arrowhead to a shaft; preparing and tasting an Indian food, Nokake; assembling a model trap; acting out stories of spirit help; playing a sorting game with pictures representing the Indians' environment.

Comment: "The Algonquins", one of our first "culture" Boxes, demonstrates how intrigued children are by doing real things with real materials. The data suggests that through the power of doing what the Algonquins did, the children came to believe that the Indians really existed, and were not just story book or T.V. figures. When the children are involved with the real materials, learning is largely non-verbal and successful. In the lessons on myth and belief, the media need much teacher explanation, and are less successful. The attempt to give an overview of the whole culture in two weeks did not work.

* Seeds (3, 4) Appendix D-4

Objective: To learn about seeds and seed dispersal through examining and experimenting with fruits and seeds.

Media: Eight basic common fruits in classroom quantities for use in dispersal experiments; data charts; pamphlets; magnifiers; cups; earth for experiments; etc.

Characteristic Activities: Examining and dissecting peanuts and beans; growing seeds; experimenting with floating seeds.

Comment: This Box is best described as ordinary. The materials are definitely useful to teachers and appeal to children, but the approach is rather standard. The Box did not go beyond presenting the children with a variety of seeds for rather simple examination and experimentation. This is the first unit to make extensive use of expendable materials.

*** A House of Ancient Greece (5, 6) Appendix D-5

Objective: To introduce children to the everyday life of an ancient Greek household by having them "excavate" the Villa of Good Fortune in Olynthus, Greece; to acquaint children with archeology as a tool for learning how people lived long ago.

Media: Authentic ancient artifacts (coins, pottery sherds); reproductions of Greek statues, pottery, and metal objects; photos of the Villa of Good Fortune; maps; filmstrips; etc.

[Special Note: For an impression of what a MATCH Box contains, see Figure 3 which shows most of the contents of this Box. Omitted are various pictures, team guides, the Teacher's Guide, and the carrying case.]

Characteristic Activities: Examining artifacts from an excavated house in ancient Greece; watching filmstrips of the excavation of Olynthus; doing some activities the ancient Greeks did - grinding cinnamon, trying on Greek clothing, lighting a Greek lamp; etc.

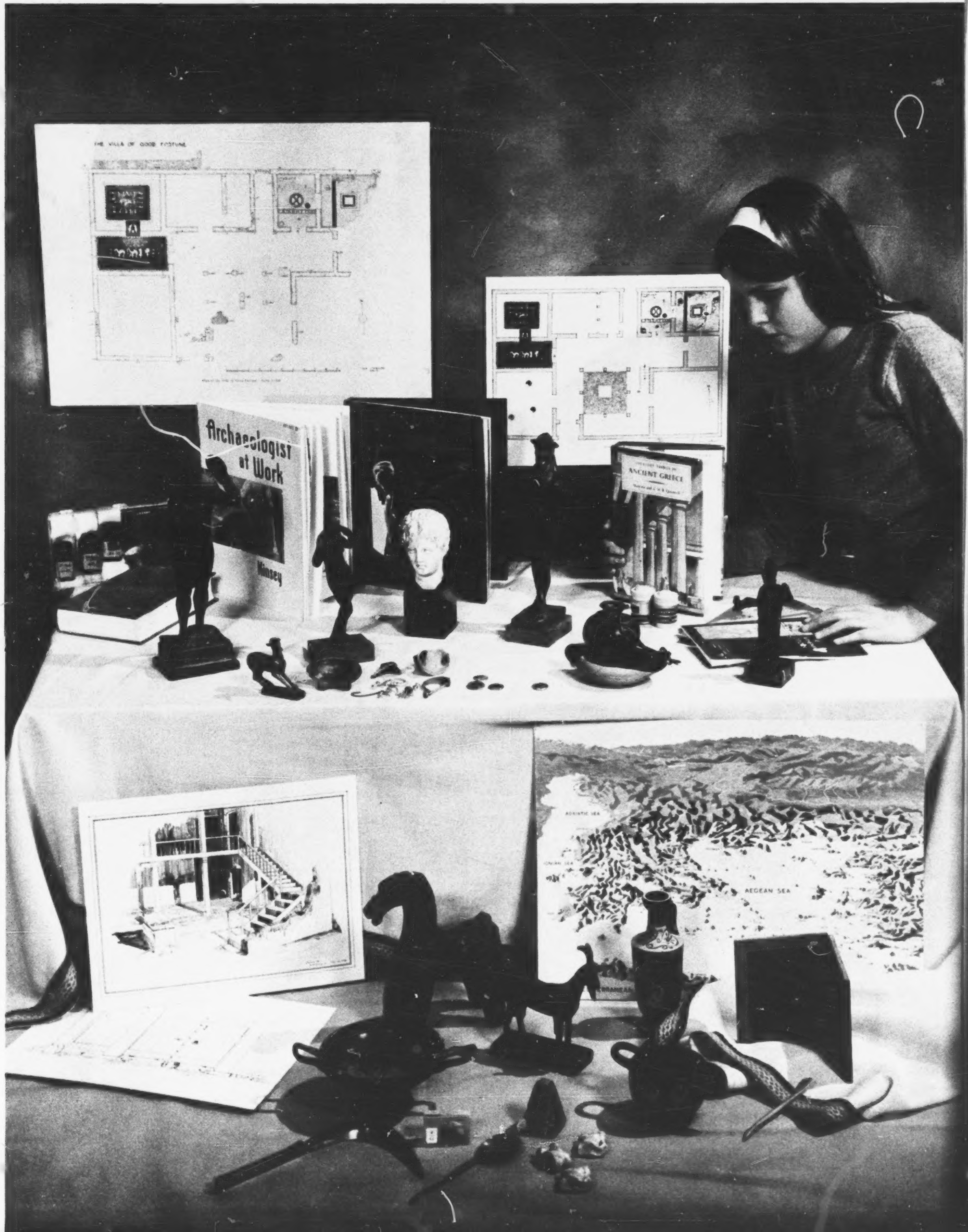
Comment: We consider this one of our most successful Boxes. The major activity - an archeological dig - is an uncontrived and real task to the children, and does achieve the Box objective. This Box first showed us the potential for learning in small, student-directed groups, and in role-play. It displaced the teacher from her traditional role as repository and dispatcher of knowledge and freed her to give individualized help to the children and to be a co-learner with them. There is a careful, dramatic building of lessons toward the climax of figuring out what the ancient Greeks did in each room of the villa. The final lessons do not give as comprehensive a picture of the restored villa as we would have liked.

SECOND GENERATION

* Houses (1-3) Appendix D-6

Objective: By comparing an Eskimo Igloo with a Nigerian mud-and-thatch house, children learn that different physical surroundings call for very different kinds of houses and ways of life.

Figure 3 Contents of "A House of Ancient Greece"
(All items in the Box are not shown)


THE VILLA OF GOOD FORTUNE
Archaeologist at Work
ANCIENT GREECE
ADRIATIC SEA
IONIAN SEA
AEGEAN SEA

Media: Scale models of an Igloo and a Nigerian hut; samples of real building materials (untanned deerskin, bamboo, mud, palm fronds); environmental photographs; films; picture pool showing houses and house building; books and stories; etc.

Characteristic Activities: Assembling a model igloo; scraping deerskin; constructing a mud and bamboo wall; grouping and sorting pictures; playing with the house models.

Comment: The models and the mud wall were very interesting, but somehow neither teachers nor children saw the idea of the Box - the concept of houses being an expression of and hence an avenue by which one can understand, the interrelation between environment and culture. The Box comes across as being about two houses, or about Eskimos and Nigerians, while the larger point is missed. Again the power of the media are evident. They, more than the developers' intentions, determine what a Box is really about.

* Animal Camouflage (2,3) Appendix D-7

Objective: To teach about various kinds of camouflage with emphasis on color matching, pattern matching, counter-shading, and disruptive patterning.

Media: Shadow box with various backgrounds and patterned overlays; model birds and animals; mounted insects; diorama kits; slides of camouflaged animals; slide projector; etc.

Characteristic Activities: Hiding and finding insects and animals against various backgrounds; sorting model birds to match them with various backgrounds; camouflaging a mythical animal to protect him from his enemies; making dioramas to camouflage an object.

Comment: This unit has a number of mechanical difficulties; the shadow box does not work well, magnets do not hold the animal models to the backgrounds, the slide projector overheats, melting the plastic housing. The media are all rather abstract and too contrived. They do not deal with camouflage in a direct way, so that the Box requires considerable verbal accompaniment. The best liked lesson involved a simple showing of slides of real animals spectacularly hidden against real backgrounds.

*** Netsilik Eskimos (3,4) Appendix D-8

Objective: To put children in touch with the traditional Netsilik Eskimos by focusing on their life during the part of the year when they hunt seals. Netsilik hunting technology, spiritual beliefs, social relations and leisure activities are shown, all as they relate to seal hunting.

Media: Authentic Eskimo artifacts and materials - (seal hunting tools, boots, seal skin, drum, amulet); three films showing seal hunting, setting up camp, etc.; model ice board and figures; Netsilik Book; record; etc.

Characteristic Activities: Recreating the seal hunt using the hunting tools; experimenting with everyday activities of Netsilik life; hearing the story of Nuliajuk, the Sea Spirit; watching and performing the drum dance.

Comment: This culture Box is highly specific. It is a carefully programmed unit with concentration on limited objectives, and strong reliance on real objects and images. It taught us to use films for their resolving quality after children have studied, explored, and speculated about materials - rather than as an introduction, which can rob objects of their interest for the children. A highly successful Box.

* Musical Shapes and Sounds (3,4) Appendix D-9

Objective: To study real musical instruments; to begin thinking about their sizes and shapes, the variety of sounds they make, and how these are related.

Media: A violin; clarinet; snare drum with sticks and brushes; trumpet; extra reeds and mouthpieces; antiseptic; pamphlets; record; photographs; a Pete Seeger film about steel drums; tubes, reeds, connectors, etc. for constructing instruments.

Characteristic Activities: Taking apart and playing real instruments; matching pictures of instruments and their sounds; constructing experimental instruments, watching (on film) steel drums being made and played.

Comment: By dealing with science and music this was the first Box that didn't "fit" into one of the standard subject matter domains. Children and most teachers enjoyed the activities, but some teachers were put off by the Box because they couldn't see what the point was. For a Box to be successful, the teacher must be "in on" it, especially when she is being asked to do something new or when the topic is one - like music - about which teachers already may feel somewhat insecure.

* Rocks (5,6) Appendix D-10

Objective: To lead children to realize that the rocks they see were not always the same as they are today; and that the rocks contain clues to how they were formed, what life on earth was like thousands of years ago, and the forces that have been at work in nature.

Media: Rock and fossil specimens; two films on mountains and volcanoes; photographs; models; materials for various experiments; geologist's hammer; goggles and other equipment.

Characteristic Activities: Breaking down rocks; synthesizing sedimentary rocks; simulating rock metamorphosis; making fossil footprints; setting off a volcano; "reading" mystery rocks.

Comment: This unit deals with a difficult problem - trying to make vivid in the classroom processes which in nature take millions of years or occur at the molecular level. With the dramatic exception of the volcano these processes are "invisible" and must be inferred rather than directly observed. The children perform classroom analogies to these processes, but it is doubtful whether these analogies succeed in teaching about the real processes. The approach was fairly standard. Some innovative media, such as a "crystal former" were created. Teachers felt they needed more information to make full use of the Box.

** Medieval People (5,6) Appendix D-11

Objective: To make Medieval people real and understandable through teaching about the daily lives of people in a fictional French medieval village, and through role playing to encourage the children to act out their responses to problems confronting the community.

Media: Costumes; props (falconry equipment, chess set, prayer book, coins, psaltery, wool carders, seed pouch); Character Books to describe the daily life of each of eight main characters; filmstrip and record; etc.; background information and references.

Characteristic Activities: Examining and demonstrating proper use of objects, acting out a hunting scene, creating and presenting a final episode in the medieval court.

Comment: This unit uses role playing as an approach to making history more meaningful. A series of smaller skits lead to class production of a trial and court scene. The main effect of the Box is to generate enthusiastic class involvement in production of the skits. Teachers found themselves drawn into a warm and insightful relationship with the children, but they wondered how much "history" was in fact learned. Children do seem to learn about manor life, living conditions, and role relationships. The "facts" of medieval history, in the history book sense, are not stressed.

*** Japanese Family 1966 (5,6) Appendix D-12

Objective: To present the suburban middle class Japanese family; its members and how they live together; its basic belongings; family manners; types of employment; recent history.

Media: Activity guides for five classroom "families"; role cards for each family member; film loops showing aspects of family life and a loop projector; real Japanese family album; household objects - religious articles, clothing, tableware.

Characteristic Activities: Role-playing in family situations; learning to behave properly with Japanese objects; setting up a Shinto-Buddhist altar, learning "shoe" manners, table manners, etc.; tracing family lines back 100 years.

Comment: One of our most successful units. Its elegance lies in the easy natural approach - through families - to modern Japanese culture. This approach builds on the child's own family relationships and makes the differences in Japan meaningful. There is an identity and cooperation built up among the children in their families - which is fun and also highly productive. The last few lessons on ancestors and history have a "tacked on" feeling about them and are still too teacher-directed.

THIRD GENERATION

** Waterplay (Nursery-2) Appendix D-13

Objective: To give children the opportunity to experience, investigate, discover, manipulate, and to become more aware of what is around them - through the medium of water.

Media: Basic waterplay materials: bottles, cups, funnels, spray bottles, pumps; clear plastic tubing with fittings and spiral-shaped tubes; a set of water wheels, troughs, and fountains that can work in a system; recording of water sounds; movie; photographs.

Characteristic Activities: Free play with the basic waterplay equipment, the water system, etc. is the major activity; related secondary activities include listening to a recording of water sounds, watching a film of children playing in water, looking at photographs of children in water.

Comment: Waterplay is our only Box for the very young child, and it aims at sharpening his ways of investigating and manipulating his environment. It is our most non-verbal Box, requiring almost no description or direction from the teacher. The media were designed to speak for themselves, to suggest many things to do with water, or to present the child with a puzzle to be worked out. Waterplay is a child-centered Box, each child playing at his own experience and interest level. Children take to it very naturally and with pleasure. Teachers do too, though some wished the unit had more structure. The Box needs to be made more durable, less expensive, simpler.

** Imagination Unlimited (4-6) Appendix D-14

Objective: To give school children opportunities to express and communicate to each other their unique interpretations, feelings, ideas concerning a stimulating set of materials.

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Media: 17 unusual objects; 25 photographs; movies of a rainshower, one from the artist's view point and one from the weatherman's; a set of 72 illustrated word cards, tape recorder, etc.

Characteristic Activities: Free associating with words shown vividly on special word cards; describing an unusual object effectively so that another can picture it; making up stories based upon photos showing a variety of facial expressions; viewing two contrasting films.

Comment: This is a non-subject matter Box, innovative in that it aims at drawing out a child's thoughts, feelings and verbal associations - at developing individual points of view rather than helping children to know a particular culture or phenomenon. It includes some standard exercises and some distinct media innovations like the word cards. It was largely successful in producing an atmosphere of free expression. Activities in which children were called upon to be analytical and descriptive didn't work as well as the ones in which they were free to use their imaginations.

** Paddle-to-the-Sea (4-6) Appendix D-15

Objective: To make the book "Paddle-to-the-Sea" more real through related objects and activities. The story is about a small carving of an Indian in a canoe which makes its way through the Great Lakes to the sea.

Media: A carved model of Paddle; charts and templates of the Great Lakes; ore and grain samples; models of a breeches buoy and a canal lock; seashore castaways; fur-trade artifacts; films about ships and logging; records; and brochures.

Characteristic Activities: Creating a large collage of the Great Lakes; rigging a breeches buoy; bartering trinkets for beaver; launching a class "Paddle", role playing, plotting and measuring Paddle's course, creative writing.

Comment: This unit is unique in that its impetus and structure derive from a story, and that it deals with the Great Lakes region as a totality, rather than separating it into history and geography etc. The Box contains a rich assortment of both materials and activities which seem to work together in the framework of the story to maintain high class interest. There are certain media and procedural problems.

*** The MATCH Box Press (5,6) Appendix D-16

Objective: To print a book, and in the process to understand essentially how all books come into being.

Media: The film "Story of a Book"; a print shop, complete with press, brayer, ink and drying rack; compositor's equipment: type, galleys, proof press; illustrator's materials for making block prints.

Characteristic Activities: The class becomes the staff of the MATCH Box Press, a portable publishing company. The children write and prepare a manuscript for publication, they set the manuscript in type, design illustrations, and print 40 copies of their book.

Comment: This is also a non-subject-matter Box. It is the only unit in which the class as a whole works on a single enterprise. The Box has turned out to be very successful. It has a simple and direct line. Subject matter can be embedded in the book that is printed, but it is the process of producing the book that remains paramount. This unit makes very clear the potential of "class project" Boxes as a type.

B. The MATCH Box

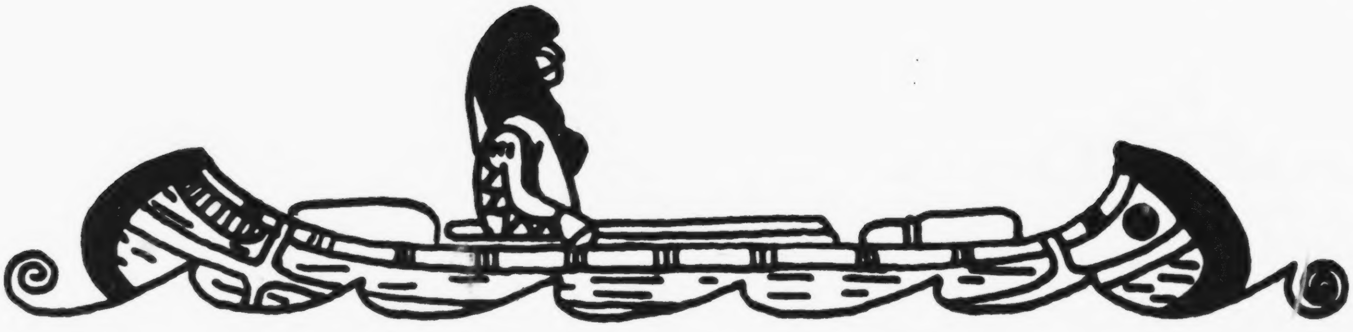
This section describes the design concept and general characteristics of a MATCH Box. Details are presented concerning the Teacher's Guide, packaging, objectives, media and activities.

Teacher's Guide: A MATCH Box is meant to be self contained and self-explanatory. Each Box contains a Teacher's Guide whose fundamental purpose is to enable a teacher at another time and place to make effective use of the Box - to bring it to life in the way its developers envisioned. The Guide organizes and patterns the three-way encounter between teacher, children, and materials.

Other ways of communicating the units were considered and are possible, but we used the written Teacher's Guide supplemented in a few Boxes by children's guides. The Guides try to provide the teacher with all the information she will need to make good use of the Box and to feel comfortable with it. Typically they include:

- what the Box is about
- what it contains: lists and pictures of materials
- an overview of the general approach and structure of the lessons
- individual lesson plans detailing objectives, materials, classroom arrangements, procedures, possible pitfalls, and assurances
- background information
- ideas for extending the unit
- information about the project, the people who made the box, material sources, and packing instructions

The next few pages are reprinted from two of the Guides. "Installment One" from Paddle-to-the-Sea exemplifies a detailed lesson plan that carefully sets the spirit of a lesson and the unit. The pages from Waterplay show a lighter touch; here photographs, comments and poems communicate the atmosphere of free play in the classroom. Additional examples of Teacher's Guides and some student guides are found in Appendix E.



Installment One

1. HOW PADDLE-TO-THE-SEA CAME TO BE
2. LONG RIVER REACHING TO THE SEA
3. PADDLE STARTS ON HIS JOURNEY

The story begins. You read the first three chapters, while showing the filmstrip so the class can "look at the pictures" as you read. After finding out how Paddle came to be and how his journey began, the children get to see a real carving of Paddle and examine one of the tools the boy used to make him. There is a discussion of dreams and where they lead us.

DREAMS

Things you'll need:

Teacher's copy of Paddle-to-the-Sea
Filmstrip of illustrations from Paddle-to-the-Sea
Filmstrip projector and extension cord
Carved model of "Paddle-to-the-Sea"
Pine block
Crooked knife

At the outset, have the filmstrip projector and screen set up in a good spot where you can be near the children and where they can see. In a room with fixed desks, put the projector on a desk about 15 to 20 feet from the screen and seat the children in front of you and around both sides.

* * * * * * * * * *

The journey begins.

Gather the children around you. If there is room to do it physically - good. If not, gather them with your voice.

Now darken the room and begin with the filmstrip. Show the first two frames, then hold, on the title page of the book. Say a word about what you are going to do, explain that the pictures are from the book, and invite everyone to enjoy the story.

Show Frame 1 and start reading. Read the first three chapters of the book, and as you read show the filmstrip. The filmstrip is meant to draw the children in to you, to make each one feel that he is at your side while you are reading to him.

We have marked your copy of "Paddle" to show where to advance the filmstrip. Vary this if you wish, but please do not go ahead of the story.

> Filmstrip: The frames are numbered to coincide with the chapter numbers. Frames 1, 2, 3...are the main, color

illustrations for Chapters 1, 2, 3. Frames lb, 2a, 5a, etc. denote margin illustrations in Chapters 1, 2, 5 etc. - the letters designating the illustrations in counter-clockwise order from the top of the page.

After the reading, keep the room dark and let the children talk about the story among themselves and with you. Show some of the pictures again if that seems appropriate.

Then, while the magic of the mood still lingers, bring out the carved model of "Paddle-to-the-Sea," the crooked knife and a pine block like the one the boy used to make Paddle. Allow these things to pass among the children and listen for their questions and comments. They may wonder whether this is the "real" Paddle. Don't tell them that it is, but try to find out what they think. They may want to think of it as the real one even though they know that it isn't. And yet, was there ever one more real than this?

Model: This Paddle and eight others were carved out of pine by Allan Conrad, in the summer of 1967. Each one took about nine hours to carve. Buz Bever did all the hand painting.

Crooked knife: Two knives are shown in Chapter 1 - a common hunting knife which the boy probably used for detail work and a crooked knife used to rough out the carving. The curved knife blade came from the Hudson's Bay Co. which has been trading such blades to the Indians for more than 300 years. This knife is one of the basic tools used to make birch bark canoes. The Indians called this knife "mocotaugen."

For a while, follow the children to wherever their questions and speculations lead. Then, if it hasn't already come up, ask them why the boy made "Paddle" and what the little Indian meant to him.

Bring the children to thinking and talking about dreams and what they mean to people.

Dreams: The book says a lot about dreams. Indians placed great emphasis on them, believing dreams to be clearer views of life than one can normally attain. Dreams often set the course of their lives; their names came from dreams. Through

> fasting, the Indians would induce dreams to guide them. For us, too, dreams serve as guides. The dreamer - though we may not understand him - has a direction, a force within him that organizes his actions, makes them meaningful, and gives them a strange inevitability. Try in this lesson, and the others, to set the children to dreaming.

Finally, tell about the next few weeks - how every day or so you will read further on in the story and how with each reading there will be some special things for the class to do.

* * * * * * * * * *

The Idea: Obviously, this lesson gets you started by introducing the unit. It should also set the style for the entire unit and establish you as the story teller. The darkened room, the pictures, the way that you read - all are meant to focus attention and make the story more vivid.

* * * * * * * * * *

McKee's book, Great Lakes Country, conveys the fabulous history and character of the Great Lakes region. We have included it for your enjoyment.

From the Pamphlet Pouch:

The Canadian Geographical Journal contains an article on how birch bark canoes are made, and shows the crooked knife in use.

Indians of the Great Lakes Area is a good general work.

Tomorrow you'll need a 16 mm projector.

Give the children plenty of time for exploration through play. Often they get so absorbed in what they are doing themsleves that suggestions from the teacher only drag them away from something important rather than lead them into it.

RAIN

The rain screws up its face
and falls to bits.
Then it makes itself again
only the rain can make itself again.

Adrian Keith Smith
Age 4
New Zealand

Can you make the water come out in a thin stream, drop-by-drop? Can you keep it from coming out at all?

Packaging: MATCH Boxes do not at all conform to the image of compactness suggested by their name. The prototypes are big and they are heavy, ranging from around 30 pounds for Seeds and Algonquins to 80-100 pounds for heavyweights such as Paddle, Waterplay, City, and MATCH Box Press.

All the Boxes are packaged differently: the idea of distinctive packages appealed to us, the Boxes themselves called for unique designs, and we wanted to experiment with packaging methods and materials. We made quite a few of the containers ourselves, buying others ready-made and adapting them. We tried cardboard containers, baskets, plastic trays, suitcases, wooden boxes, and for the Bird Box we used commercial animal-transport cases with plastic tops. Almost every unit had so much material that two separate cases were required - the MATCH Box Press takes three.

Packaging has a great deal to do with how a Box is received by a teacher. With so many materials to use and keep track of, the package has to be much more than just a durable shipping carton. It has to organize the materials in a way that is relevant to the unit. If the Box appears as a clutter of things, the tentative teacher may easily be discouraged from using it. The package, together with the Teacher's Guide, works to make a Box inviting.

For convenience in the classroom, and also in circulating and servicing the unit, the package should be designed to provide both storage and easy checking. Typically this was handled through compartmentalization.

The packages need to be durable, and portable. Since we constantly had trouble controlling the weight of the contents, we wanted the package to add as little weight to the unit as possible. Light materials are not always durable, however. For lightness, many of our Second Generation Boxes were constructed of cardboard; but they did not hold up well. Plastic containers offered the best solution to the weight-durability problem. Heavy units were often divided into two or more coordinated and manageable units. The containers need to withstand frequent loading and unloading into trucks and station wagons, and occasional shipment via air freight or United Parcel Service.

The packages themselves can be functional parts of the unit. For example, the lid of the City Box is a metal chalkboard on which magnetized model buildings are erected and displayed to the class; one of the Eskimo containers, a big tube, is a cross-sectional model of a seal breathing hole; the Camouflage Box container becomes a shadow box; two of the MATCH Box Press containers are type cases, ready to use as they are, while the third container folds open to become the press room.

Objectives: MATCH Boxes have three main classes of objectives - subject matter, skills and processes, and self-awareness. All three of these kinds of outcomes are found to some degree in each Box but the proportions vary.

Subject matter objectives involve learning about something - medieval France, animal camouflage - something that is "out there" in the world. Facts, information and concepts are conveyed to the child.

In other Boxes learning a process is a major objective. The child learns how to learn - how to approach a problem, how to reason inductively and deductively, how to draw relationships. The children are participants in this process.

Some of the Boxes emphasize the child's learning about himself and his own capacities. These attempt to get the child working at his optimal level, to make him aware of himself as an individual, and to build his confidence. In our thinking about Boxes and in our treatments of them there has been a trend across the generations from subject-matter Boxes toward ones which bring out what is in the child.

All Boxes involve these three kinds of objectives to some extent. No Box pushes subject matter for its own sake, but rather as a way to help the child order his world, make sense out of it, know certain things about it, and be more comfortable and confident in it.

Media: Here are the kinds of things MATCH Boxes contain:

real objects: 2300-year-old Greek pottery shards, chopsticks, navigator seeds, starfish, whale's tooth, Algonquin arrowheads, seal skin, beaver-chewed log, stuffed owl, old purse, Netsilik bow drill, clarinet, lead type, deerskin, bones, steel drum, harpoon, map measurer, pumps, syringe, buckets, mops, hammers, goggles, pipes, funnels, psaltery, stethoscope.

reproductions: falconry lure, medieval clothing, Japanese photo album, Greek coins and statues, Indian leggings.

models: city buildings, igloo, mud house, lock model, birchbark canoe, sea ice at Pelly Bay, folding rock strata, figure "4" trap.

films, filmstrips, film loops and slides.

photographs of almost everything.

recordings: a Netsilik woman telling a story in the Eskimo language, a medieval shrew recounting her experiences at court, bird calls, songs of the voyageurs, reminiscences of a Great Lakes captain, an Eskimo myth, an Algonquin's dream.

equipment: tape recorders, various projectors, screens, extension cords.

soft ware: charts and diagrams, floor plans, worksheets, maps, bird stickers, sort cards, word cards, recipes, student guides, character books, reference books.

supplies: cinnamon, olive oil, seal oil, geodes, dry mud, cranberries, ink, paper, chemicals, diorama kits, soapstone, magnetic tape, parched corn.

and more.

The question, perhaps, is why all this stuff. We started out by asking ourselves the questions: who is the learner?, and what is to be learned? When you really listen to these crucial questions, there is no choice but to consider many media. How else can you reach the different kinds of learners? How else can you communicate the rich variety of learnings?

MATCH Boxes demonstrate that anything at all can be used to mediate learning - even a wastebasket full of rubbish can be "excavated" (Greek Box), and an old sneaker cast up on a shore can cause much speculation (Paddle).

With this outlook, it becomes clear that one cannot design media without also designing ways of using them. One must constantly ask, what are the children going to do with the stuff. This is a recurrent point - that materials and activities and objectives have to be developed together.

Very early in the project we realized that MATCH Boxes could not be assembled from ready-made components; that we would have to design and develop most of the items ourselves if we wanted a variety of media that worked together.

MATCH Boxes contain many real objects. This resulted from our intention to develop materials that communicate non-verbally. We used real objects as a way of underpinning symbols with concrete referents. We also used them because of their extraordinary power - it makes a great difference for a teacher to be able to say "Yes, those pottery pieces are really 2300 years old. Yes, someone in ancient Greece really made them"; or for her to confirm that Itimagnark - a Netsilik hunter in the film - really made the snow knife that the children are holding. This is the classroom equivalent of seeing a real dinosaur at a museum, of standing "on the very spot..." at an historic site, or of being in a high and windy bell tower and seeing the name "Paul Revere" on the green bell.

Our notion of how to use media changed over the three generations. We first saw them primarily as devices by which to convey higher order concepts: the Grouping Birds Box, for instance, used birds to teach classification. But we found that media have - or are - their own messages and it simply doesn't work to try to get the media to do things that are unnatural for them. They refuse. So we have come more and more to let media speak for themselves, allowing learning and teaching to follow.

We have become increasingly aware of the need to design materials for everyone in the classroom. Originally, the term "MATCH" stood for Material Aids for Teaching CHildren. Then we saw that we didn't really want to develop materials that were "aids" for teachers to use "on" children - what was needed were materials for teachers to use with children. And so, the Project was retitled Materials and Activities for Teachers and CHildren.

One of our major project purposes was to learn something about how to combine media. We thought perhaps a grammar of some sort could be established, but this looks naive to us now. Combining media is a process, so that at best, we can offer only certain general principles in addition to the ones already implied throughout this report.

Media can only be combined with respect to some purpose, and some learner in a particular setting. The materials need to be set in a context of real activities.

Media can be combined to offer contexts for each other so that learning has a place to go. Two or more items can give meaning to each other: for example, the real seal hunting tools add dimension to the film that shows them being used, etc.; a volcano film and chemical volcanoes that can be fired off in class provide feed back to each other; the various tools and techniques used in printing are already so well related that one barely notices how they provide mutual meanings.

With respect to a class, media combinations need to have variety in order to reach many different children, and sustain various and interrelated forms of participation by both the teacher and the children.

Activities: MATCH Box activities are also diverse: making things like a mud wall, or books or "nokake", an Indian food; using tools like the bow drill; assembling models and musical instruments; role playing; writing; telling stories; making presentations to the class; playing games; trying to solve a problem by "reading" objects; discussing things; sorting pictures.

Activities are nearly as diverse as materials and some of the same thoughts apply to them. Activities need to be designed together with materials. They need to be "real" to the children and relevant to what is supposed to be learned. They need to be engaging, and designed in a way that permits learning to advance along its own course without incessant interruptions or dead ends.

Again, it is difficult to see neat categories or limitations on what is a proper learning activity. There are thousands of things that children can do to learn.

The way in which an activity is organized in the classroom is important too. We have made considerable use of the small 4-6 child group, which seems to be a highly productive unit because of the stimulating and generative effect that the children have on each other. But the form must be designed to suit class sizes, space, the number of materials that can be supplied.

Another consideration is that concurrent activities have to take each other and the class as a whole into account. An activity for only half the children is not good. Nor is it good if four groups are working and one is suddenly finished and has nothing to do. Activities must be designed with thought for the entire classroom situation.

And what about the teachers' role? It needs to be thought of and designed into the system too. In the Boxes she tends to become an integral part of the activities - a co-learner, rather than the person apart who explains the activities. In the Medieval Box, for instance, she is the director/producer of the skits and plays.

Day to day activities must be combined with care toward making the whole Box experience come alive. Each lesson should lead to the next, building toward some kind of climax and resolution for the whole unit. This involves careful pacing, variety, and above all, a sense of the dramatic structure inherent in anything to be learned.

The single most important characteristic of learning activities is that they place the responsibility for learning in the child's own hands so that he becomes the agent of his own learning. As the commercial says "...Please, Mother! I'd rather do it myself." Children would rather do things themselves and we think they should.

The MATCH Box Experience: A MATCH Box - in its fullest sense - is not the sum of its media, objectives, and activities. It is not a thing. It is more truly the experience, the happening, that occurs when the children and teacher encounter the Box.

C. How Teachers and Children Responded

This section characterizes how teachers and children responded to the Boxes. To do this we will take you on a "tour" of the Teacher's Final Appraisal form (TFA) used in the Second Generation. We have chosen this approach because it conveys the kinds of questions that we asked, and it preserves the vividness of the teachers' responses.

The data reported are based solely on the Second Generation Boxes. It was only in this Generation that we used both a standard TFA for all Boxes and conducted an analysis permitting us to make cross-Box comparisons and summations. (In the First Generation separate analyses were conducted by the individual co-leaders, and in the Third Generation separate TFA's were designed for each of the Boxes.)

The seven Boxes dealt with here are: Houses, Camouflage, Eskimo, Music, Japan, Rocks, and Medieval - a fairly representative group. Data is based on 157 teachers who participated in evaluating these Boxes in the fall and winter of 1966-67. Teachers filled in the TFA after using a Box for a full two-week period.

All of the questions asked on the TFA are not treated here. Some have been omitted because the answers are too redundant, others because they are too specific to a particular Box. Responses to fixed-answer questions are reported as percentages of the full sample of 157 teachers. The responses to open-ended questions are characterized by a sampling of direct quotations from the teachers. Comments made by single teachers are occasionally included to show the range of responses, but for the most part "minority" responses are not reported.

To supplement and provide a context for this data, we refer the reader to Appendix B, where key evaluation forms are reproduced, and to Appendix C which contains the complete analysis of one Box - Japan - as well as some cross-Box comparisons of responses to the fixed-answer questions.

Shall we begin---

TEACHERS FINAL APPRAISAL - SECOND GENERATION BOXES.

[On this tour, questions are stated as they were in the TFA, and, except for the omission already mentioned, are presented in the same order. Quotations have been drawn from all seven of the Boxes. Along the way comments like this one are set off by brackets.]

Section A. Effect on the Teacher. The following questions concern your personal experience with the Box.

1. Please describe how the Box affected you. e.g., Did you enjoy using it? Did the experience significantly alter your interest in using a variety of instructional materials or in the subject itself? Did some aspect of the experience stand out for you? Was there anything that you found surprising or annoying?

[Teachers gave answers such as these:]

> "I thoroughly enjoyed using this box."
>
> "I have seen how much more actively involved the children become in a unit when there are things for them to see, feel, and use."
>
> "I enjoyed having so many instructional materials at my fingertips."
>
> "The students were so delighted and enthusiastic about the Box that I was also pleased."
>
> "I found the Box one of the most interesting and provocative ways of introducing a subject and of keeping up a sustained interest."
>
> "I particularly enjoyed witnessing the reactions of the children to the films and the building materials and listening to the talk among themselves."

2. [The following question was asked to find out if teachers felt "in on" the unit.]

Did you generally feel that you knew what you were doing and why? 88%, or that you were simply carrying out a mechanical set of procedures? 10%. no response 2%.

3. [Tests are usually relied upon rather heavily to assess student performance. Our Boxes did not contain tests and so we asked this rather loaded question.]

"Did you ever crave a test in order to tell you what the children were learning? Please explain."

Yes	No	nr
27%	70%	3%

[Teachers who said "Yes" gave reasons such as these:]

> "A teacher must have some tangible evidence for checking concepts she hopes the children have gleaned."

> "Not a test, but some means of seeing if it was presented in the right way."

> "Curiosity - I wanted to find out if they were gaining more from this type of experience."

> "You cannot take a test-oriented child, as most are today, and expect him to feel that the teacher regards something as important if she isn't willing to test him on it."

[Teachers who said "No" gave reasons such as these:]

> "A test would spoil their enthusiasm and delight."

> "I did not need a formal test to see what they were learning. I could see it from their interest, work, and presentations."

> "I didn't feel a test was necessary as the children continually incorporated previously learned material when examining or discussing new ideas."

> "Understandings, a feeling of closeness and familiarity with another group of people, the carry-over of interests and attitudes which emanate from this unit into other endeavors can only be tested by observation."

4. [Our first generation data showed that some very fine things were happening in the teacher-class relationship while the MATCH Boxes were in use, so we asked...]

In what ways, if any, did your relationship with the children change while you were using the Box?

[About 1/3 of the teachers said that they were unaware of any change. The others noticed changes such as these:]

> "I think the children and I felt that we, teacher and children, were learning together."
>
> "It became friendly, close and enjoyable. The shyness disappeared from the classroom."
>
> "I have a greater understanding of individual differences in the children."
>
> "I lost my discipline completely. The pressure of a lesson every day caused me to be impatient with the children."
>
> "There was a greater interchange between the children."
>
> "I did less teaching, they did more discovering."

5. How do you like teaching with the MATCH Box compared to the usual materials and methods you use to teach this topic or similar ones?

> "This is teaching!"
>
> "It involves more work than reading and coloring duplicated sheets, yet much easier than trying to gather books and museum pieces on my own."
>
> "The organization and quality of the materials make the kits most valuable to me."
>
> "I found the use of the MATCH Box a pleasant change from the usual report approach to Social Studies. Through this Box we covered a limited area, but their learning was real and thorough and not the usual result - factual knowledge."

> "Basically, a teacher's method does not vary much from that of the MATCH Box method. The difference is mainly the materials provided."

> "The lessons and objectives are too vague and unstructured for the fourth grade."

Section B. Effect on the Children

1. Illustrate for us what your class got out of the Box experience by describing what happened with one or two particular children. Please use quotations and examples to show: what they really learned; whether their attitude toward the subject, or you, or other children was affected; how their interest may have shifted; how they used free time; what objects or activities they particularly enjoyed; what ideas they had; how their participation was affected; and, of course, what difficulties or confusions they may have experienced.

> "All the children were enthused when I opened the Box. Attention was excellent."

> "The children used their lunch and recess periods to play with the models. They showed reluctance to leave the lesson to go home."

> "Listening to the children talk, get excited and respond to the Netsilik kit - one would never realize these children are retarded."

> "Brian - slow learner - finds school difficult - really found success through this unit - he could identify all rocks and fossils - it was the first time he showed much interest in anything."

> "On the Eskimo work during Lesson 6 - 'This is hard! The Eskimo must be busy most of the time'."

> "The play acting was new and a few shy and/or slow children had a chance to come forward and be counted for the first time."

> "Several children spoke of enjoying the unit because it was as if I was there." (Japan)

> "Written classwork was not up to standard during the period of the MATCH Box study."

2. Would you say the children themselves know that they have learned something?

Yes	No	nr
90%	6%	4%

Please say a word about any signs they may have given you to indicate this awareness.

> "Keen awareness in the school orchestra instruments at Christmas program, big instruments make low sound, small instruments make high sound."

> "Their constant questions and skeptical opinions of the Japanese I.E. rules and the very serious manner through which they carried out their family roles made me realize the depth of their learning."

> "Jacques [a peasant] was going to write a letter in one skit until all of a sudden someone realized that he would not have been able to write. Great pride was expressed when corrections like this were made." (Medieval)

3. Please describe any instance where the children showed a significant new understanding or insight as a result of using the Box materials.

> "Classroom volcanoes - they now understand what we mean when we say that volcanoes erupt and volcanoes form mountains."

> "The children were quite surprised to learn exactly what petrified wood is and how it is formed."

> "The hole in the violin and what happened when it was covered."

> "Several children were able to comprehend the social place of the people of medieval time through the use of the costumes (type of material, colors, etc.)."

> "The idea of women being sub-servient to men was new and quite difficult for them to believe. It was my first realization that these children actually visualize the woman as being head of the household." (Japan)

4. Compare the way your class responds to the MATCH Box to the way it generally responds to other similar units in your curriculum. Check the most appropriate reply to each item. Construct items of your own, if you wish, at the end of the list.

In general while using the MATCH Box	more than usual	same as usual	less than usual	nr
Class interest in subject	82%	14%	3%	1%
Apparent learning of subject matter	54	33	7	6
Spontaneous questions generated	59	34	4	3
Less verbal children involved	56	40	3	1
Children liked what they were doing	85	13	1	1
Number of children involved	50	42	3	5
Attentiveness	67	29	3	1

Section C. Other Effects

Please describe any immediate effects the Box may have had on things or people outside of its regular use, e.g., Did children bring things in from home? Did other teachers or the principal become involved in it? Did you hear anything from parents? Are there any techniques suggested by the Box or invented by you as a result of using the Box which you plan to use in other subjects?

> "The children brought in quite a few things from home - books, pictures, seal skin, slippers, books containing Eskimo legends."

"I have never had such fantastic response as far as bringing things in from home."

"Yes, in fact I had fathers, mothers, uncles and aunts sending in items."

"One child from another class came into the room with a message and later I found he was still playing at the table with my children."

"The other teachers were interested and asked lots of questions about the materials on display."

"Parents, on P.T.A. night, and during conferences mentioned that their children would tell them what they had done that day with instruments."

"There was no response from home which is fairly normal here."

"It has been an interesting experiment and I believe has helped me to develop an attitude of learning because I want to learn, not because I have to learn."

"I hope to use as many real things as I can when teaching a lesson."

"I definitely intend to incorporate the inquiring attitude in further study."

Section D. The Box in Use: The next questions pertain to the operation of actually using the Box. Some questions are similar to the ones asked on the daily forms. Please answer these from the point of view of your overall experience.

1. In terms of OVERALL SUCCESS, how would you characterize your experience with the Box?

Very Low	Low	Average	High	Very High	nr
1%	4%	15%	53%	23%	4%

[A total of 76% of the teachers rated success as "high" or "very high" while only 5% rated it as below average. This result seems overwhelming.]

2. Here are some DIFFICULTIES you may have encountered with the MATERIALS. Please check the ones you experienced and give a brief explanation at the right.

*10%	difficulty using such a variety of materials.
18%	difficulty finding, identifying or keeping track of items.
25%	difficulty carrying the Box, unloading it, or finding a place for it in my room.
12%	difficulty repacking the Box.
10%	other difficulties.
25%	no difficulties mentioned.

*[Note: Some teachers mentioned more than one type of difficulty. These are percentages of total difficulties, not teachers.]

3. Please rate how suitable the MATCH Box was for you and your class in the following aspects by checking the alternative which best joins the 2 parts of the sentence. Give a word of explanation for all the "poorly suited" replies and as many of the others as seem to require it.

	Poorly Suited	Suited	Well Suited	nr	
Difficulty of Material	11%	48%	38%	3%	to level of class
Organization of Box	6	40	51	3	to efficient learning
Amount of daily preparation	32	50	15	3	to time could devote to it
Once familiar with Box, amount of preparation	8	37	49	6	to time could devote to it
Materials and Activities	8	34	55	3	to each other
Subject-matter of Box	27	35	33	5	to curriculum
Period of two weeks	*65	21	11	3	to realistic use of Box
Other curriculum commitments not factor, Box	29	27	34	10	for use in two weeks
Teaching approach in Teacher's Guide	12	48	38	2	to regular teaching style

*Number of weeks suggested:

One	Two	Three	Four	Five	nr
3	4	55	46	6	43

4. Please comment on the usefulness of the Teacher's Guide. Consider organization, adequacy of information, amount of detail, and the spirit of the thing.

> "It was of tremendous value to me."
>
> "Teacher's Guide was helpful but could have contained more information on identity of materials, answers to questions, and expected outcomes."
>
> "In my opinion the aims or objectives for the lessons should be specifically stated and more detailed information on the subject matter should be included."
>
> "The spirit was quite good. It made me feel that I should relax and enjoy the box along with the children which I did."
>
> "I liked it - it gave me latitude yet was thorough in guiding me through new material. I felt free to modify and change lessons when I wanted to."
>
> "The Teacher's Guide was seemingly prepared with the teacher in mind, a rather unique approach! It gave thorough but concise preparation, was well organized, and allowed for individual adaptation and approaches."

[From another question we asked, it was clear that most teachers would have preferred to have the Guide at least a week prior to receiving the Box. The need for this might disappear after a teacher has once used a Box.]

Section E. Recommended Changes

Please tell us how you would change the Box. What would you omit or add? How would you alter the approach or lesson sequence? How could it better suit your curriculum?

[Here is a sampler of the suggestions we received.]

Music

"Would like to have had more information regarding the steel drum and how to make it successfully."

"Include more instruments (especially clarinet)."

"Making the instrument with pipes seemed a little dragged out - I would try it in one or two lessons."

"I would like to see more jars for sterilizing the mouthpieces."

Rocks

"Be more specific about mixing cement with sediments."

"Make directions simpler."

"I think I might add a movie showing geological changes wrought by glaciers and earth quakes."

Houses

"More skins to sew and scrape. More needles."

"Addition of a filmstrip on modern city life in Nigeria as well as country homes."

"I would definitely not recommend this Box for first grade."

"Allow more time for use."

"Integration of the materials to the reading, social studies, and language program."

Japan

"Add more records, music, language."

"I feel the film loops could use improvement. There wasn't enough about a topic such as 'work'."

"I would eliminate Lesson 8 and expand on religious ceremony in Lesson 4 and 5."

Medieval

"Involve more girls in the play and give them bigger parts."

"Add several large pictures of life in medieval manor to aid children in visualizing life, dress, manners of period."

"Father Gregor's costume is not realistic."

Camouflage

"Rewrite the 'Tale of the Yang' - the ending leaves you up in the air."

"An extension cord should be included."

"The box should be larger."

"More slides and/or movies as we all enjoyed that the most."

"I would omit some of the slides."

Eskimo

"Could you include a thermometer?"

"I would have appreciated some method of instruction on how to set up the harpoon."

"Many wanted to have more games."

"No change whatsoever."

Section F. General: Now, these questions don't seem to fall into a neat category, but we are very interested in your answers to them, so please answer each on its own terms.

1. Please comment on whether the materials in this Box and the approach seem appropriate to what the Box is trying to say.

Yes	No	nr
85%	7%	8%

2. From an educational standpoint would you say that the learning outcome for the children is worth the time and effort required to use this Box?

Yes	No	Difficult to Judge	nr
84%	10%	4%	2%

3. If you see the MATCH Box as a different way of teaching and learning when compared to your normal approach and technique, please tell us what the difference is.

> "The difference is that the teacher is a resource person or aid, and not a lecturer. They are learning by doing, and not merely by reading or listening."

> "What makes the approach different is the availability of materials in the MATCH Box. A complete kit is wonderful."

> "The students are actively, vitally involved. Each one realizes he is important to the success of it. There was no pushing or prodding to get students to work."

> "I don't see it as different from my way of teaching."

> "In reading, for example, we introduce the story, go over vocabulary, read the story and then analyze it to death. Put a written exercise or test on top of this and I've lost 90% of the class."

4. How do you personally feel about this relatively concentrated treatment of a subject as compared to the common practice of treating this much content over a longer time?

"I feel the concentrated treatment is truly effective, never boring, and created a continual atmosphere of 'don't waste a minute - it will soon be gone - make the most of it'."

"The time limit prevented me from correlating this unit with other subject matter in the curriculum."

"It maintains a child's interest but does not allow time to broaden it."

"The more concentrated time allowed the children to compare and contrast information that was fresh in their minds."

"I honestly couldn't take the noise and confusion for more than two weeks."

"It is far superior to the other method, but we would have to give back to the other subjects time taken from them in the following weeks."

5. Would you like to see the curriculum built around more units like this? Say 10 a year.

Yes	No	nr
69%	26%	5%

[The analyst felt that these answers were to the first part of the question only - and so constituted a response to the idea of using more kits without agreeing that 10 per year is a reasonable number. Many, specifically indicated that they thought 10 would be too many - preferring perhaps 3 to 4.]

6. If available would you use this Box again?

Yes	No	nr
86%	10%	4%

SUMMARY AND DISCUSSION

These data and others that we gathered show the Boxes to have produced certain main effects.

1. Teachers were very pleased simply to have such a variety of materials "at their fingertips" as so many of them said. They recognized that they didn't have the time or the resources to acquire such materials on their own. This point has a number of implications. It shows that just getting materials to the classroom is crucial. Just encouraging teachers to use materials is not enough to make it happen. When materials are supplied, they are used with interest and appreciation.

With a set of interrelated materials it is important for the class to have all of the materials to work with for all of the time that they need them. There are so many times when one wants to compare an object with a picture, or when it would be nice to check the film again, or to have another try at assembling the model. These critical occasions, when learning wants to proceed, are lost if materials are missing - perhaps because they are being "shared" among a number of classes.

Finally, it seems to us that curriculum materials of this type and complexity cannot be developed on a significant scale by full time teachers. Special development groups, within or outside of the school system, will be required.

2. Teachers also recognized and appreciated the "system" quality of the units, their completeness, the integration of materials and lessons, the sense of a total design.

3. Many teachers saw the MATCH Boxes as a different way of teaching. The materials themselves made it different, but the teachers mentioned two other very important points: they saw the overall strategy as different, and noted a difference in their relationship with the children.

With materials at hand, learning can proceed from the materials and doesn't have to proceed from the teacher. She does not have to be the repository and dispenser of information. With materials instead of the teacher serving as the learning medium, the teacher is freed to become a co-worker or co-learner and associate of the students. Teachers found this collaborative relationship personally satisfying. They relaxed their hold on the class, allowing the children to have more responsibility for what they were learning. In a situation like this it seems that the teacher is freer to be herself. Her personality and the learning task itself are separated. The children are not placed in the position of having to "read" her - they can concentrate on the subject that matters rather than on the subject who matters.

4. Many teachers reported that a previously unresponsive child had come alive, had participated for the first time, or that a certain child's performance surprised them. The Boxes provided an occasion for the teacher to get to know the children - and, indeed, for the children to get to know each other. Thus, the experience had both a communicative and a diagnostic effect. This is particularly well characterized by what one teacher said after evaluating the MATCH Box Press in October: "...my relationship with these pupils today is that which takes me until April to establish other years."

This effect is one of our major findings and has been confirmed many times. It leads to a much expanded notion of what a mediating system can be, and suggests units whose prime function is to establish relationships between teacher and children and among children.

5. Typically, about 70% of the teachers felt that special tests were unnecessary and that they could usually tell what the children were learning from what they were doing and saying. This is probably a direct outgrowth of their more collaborative relationship with the children, and the fact that materials enable student performance to become visible. Written tests are often relied upon because the teacher has no other signs of student performance. After all, she needs feedback too, and tests provide some. The trouble is that tests provide only a limited type - usually in verbal form. This denies the richness of human expression and is unfair to the many children who happen not to be symbol manipulators. The teacher is stuck - she often knows no other ways of assessing performance, and works in a system that pays very little attention to other kinds of performance measures. But the children are stuck even more, because they don't know what's happening and grow up thinking that this is how things are meant to be - and some of them become teachers.

Quite apart from anything else, MATCH Boxes provide the occasion for a much richer array of student behaviors than normally occur or are permitted. For some teachers this was threatening at first, and their reaction was to shut it off, interpreting it perhaps as wildness, disobedience, etc. But most soon saw that the response was productive and revealing of student capacity, and used it to reach and to teach children.

6. The Teachers' descriptions and our observations present an overwhelmingly clear picture of child involvement, interest and attention. The children talked about the Boxes at home and with other children; they brought in related things from home; they often spent free time with materials; they were provoked to look things up and to take books out of the library. At least half of the teachers judged interest, spontaneous questions, the involvement of less verbal children, the total number of children involved, and general attentiveness to be "more than usual". Hardly any of them reported the children responding "less than usual" in these respects.

7. Teachers generally saw the Boxes as educative. Recall that 54% of them judged apparent subject matter learning to be "more than usual" while 33% judged it to be the same as usual, and only 7% thought that less subject matter learning was taking place than usual.

84% judged the learning outcome to have been worth the effort and time that the Box required.

8. Quite a few teachers saw value in concrete experiences with real objects. Some felt their teaching methods were changed by the Box experience: in the future they planned to use more real objects and to approach more subjects with the inquiry method. 69% said they would like to see the curriculum built around more units like MATCH Boxes. 86% said they would use the Box again if it were available.

9. Many things were found wrong with the Boxes. They were all judged too heavy. (The City Box, for example, has been dubbed the "double hernia Box" by our School Services Department.)

To a woman, practically, all teachers felt that much more time was needed to use the Boxes even though many liked a concentrated unit. Suggestions for improving the Boxes, dealing with media ideas, ways of improving lessons and lesson sequences, were diverse, numerous and useful. If the Boxes are revised, many of these ideas will be incorporated.

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D. Other Outcomes

The project has had a number of important effects upon the Museum itself as well as other people and institutions. None of these were stated project objectives, but they have become significant results.

THE CHILDREN'S MUSEUM

The project was carried on while sharing a roof, facilities, and staff with The Children's Museum of Boston. During the period of the project, the Museum itself was undergoing far reaching changes. Certain distinct aspects of its services and resources were affected by, or grew out of the MATCH Box project.

1. Circulation of Boxes to Schools: Following their evaluation, copies of the MATCH Boxes were turned over to the Museum's School Services Department for regular circulation to schools on a rental basis. This department has been circulating smaller exhibits, live animals, cases of mounted birds, etc., to schools since 1936. In 1967 it circulated 5400 units including MATCH Boxes to about 500 different schools.

The First Generation Boxes began circulating in February of 1965. Others were added in succeeding years. At present, about 70 Boxes are in active circulation. Last year there were 493 circulations. The total since 1965 has been 710 circulations reaching approximately 21,300 children. There has been very little loss and deterioration.

One set of Boxes has been designated for use in displays and demonstrations outside the Museum. Another set is available for display and examination at the Museum's Workshop of Things, a resource center for teachers.

The project was actually first funded by a grant of $10,000 from the Committee for the Permanent Charity Fund of Boston. This money will buy copies of the first production MATCH Boxes which will be added to our circulating inventory.

Following its use, each Box is returned to the Museum for checking, repair, replacement and replenishment of items. We call this "turnaround". This process is important and needs to be done with care, but it is not complicated. Any school system can handle turnaround as part of existing library, A-V, or curriculum materials center operations.

Where no such operations exist, an interested teacher can handle scheduling and normal maintenance. School systems are likely to introduce such kits gradually in response to teacher interest and demand, so that circulation and maintenance procedures can grow accordingly. The extent and expense of turnaround depends on how the materials are used, but does not appear to be prohibitive.

2. MATCH Box production: The Museum is cooperating with American Science and Engineering Inc., in the commercial production of MATCH Boxes. The Japan, Greek and City Boxes will be available in a trial edition in September, 1968. These first Boxes will resemble the prototypes quite closely in contents and conception, though packaging and other design improvements will be made. If they sell, then more extensive revisions will be incorporated into a first commercial version of these same units. And if these sell, then other MATCH Box titles will go into production, and the development of new units will be undertaken.

3. Workshop of Things: The MATCH Box Project gave great impetus to the Museum's plans to establish a materials resource center for teachers, group leaders, and others. Such a center, called the Workshop of Things, was opened in September, 1967. Opening of the Workshop came in part as a response to the growing number of requests for MATCH Box demonstrations from in-service training and curriculum revision groups and teacher training institutions.

The Workshop contains three-dimensional materials in science and social studies that have been contributed by various organizations. MATCH Boxes constitute a large part of the collection and are the backbone of many of the specially programmed demonstrations that the Workshop offers. A smaller contribution made by the project was a large collection of catalogs, and source lists used during the development of the MATCH Boxes.

4. Discovery Boxes: These are small trays containing a few objects and some instructions which staff members can use in informal encounters with children who visit the Museum. A number of these boxes are direct descendants of the MATCH Boxes. For example: "Soapstone Carving" (Eskimo Box); "Japanese Shoes" (Japan); "Eskimo Clothing" (Eskimo); "Arrow Hafting" and "Scraping Skins" (Algonquin).

5. School Programs: The activities, materials and the thinking that went into MATCH Boxes have influenced the development of some of the programs that the Museum offers to visiting school classes - particularly

one that takes place in an Algonquin Wigwam. The day may come when a class visit to the Museum is anticipated or perhaps supplemented by a coordinated Box sent out to the school.

OTHER MUSEUMS

Other Museums have generally shown very little interest in the project. This surprised us because we see Museums as being in an excellent position to circulate such materials.

SCHOOL SYSTEMS

Through Box tryouts and evaluations we established excellent, cooperative relationships with many school systems. Staff members were invited to demonstrate MATCH Boxes and to discuss the project with curriculum revision groups, etc. For some time before the Museum's resource center opened, the project offered montly MATCH Box demonstrations for teachers and others.

We worked particularly closely with the schools in Wellesley, Lowell and Newton, Mass. They participated in tryouts and evaluations; they invited staff members to be consultants for in-service training programs. Wellesley used staff consultants to work on the development of its own Collaborative Learning Media Packages. In Newton, "Paddle-to-the-Sea" was evaluated as an approach that could tie in with its own unit on the Great Lakes. Lowell has sponsored a full semester course in curriculum development in which teacher teams develop multi-media units on their own, based on the MATCH Box model. And there is just no question that these three systems strongly influenced American Science and Engineering's decision to undertake production of these rather unusual, complex and expensive materials.

TEACHER TRAINING INSTITUTIONS

Harvard's Graduate School of Education, Wheelock College, and Tufts University have invited MATCH Box presentations to make student teachers aware of new methods and materials. A particularly close tie has developed with Lesley College in Cambridge, Mass. Students there have used the Boxes in micro-teaching situations and have worked with us on some design problems. A new kind of curriculum development course in which teacher teams develop MATCH Box-like units, has been created and offered through Lesley College to teachers in Lowell, Mass. under a special Professional Improvement Program. The prototype course has been very successful and may lead to its being offered as a regular graduate course at Lesley and eventually, perhaps, at other teacher training institutions.

E. Project Plans and Methods:

Three Generations: As a general strategy, developing the Boxes in three generations was a good one. From each generation we learned things that influenced the development of the next. We detect distinct growth in our conception of a multi-media system.

But we could have gone further if there had not been such a long (9 months) overlap between generations. During the overlap periods, staff members were working on two generations at once, which created pressure, allowed no room for the unexpected and too little time to fully assess and absorb what had been learned from the preceding generation. If a series of developmental phases are intended to build on each other there must be adequate time to distill findings, to study their implications and to more deliberately incorporate these into new designs - here is one case where a generation gap would be useful.

The Development Cycle: For materials of this type, the development cycle seems about right in terms of overall duration and the stages into which it was divided. Some Boxes could have been done in less time, others would have benefited from having more. Adequate time for tryouts is probably the crucial factor in the development stages, and at least six months for evaluation and wrap up seems necessary.

We do not feel that creative work was inhibited by having to produce under the pressure of deadlines. In fact we believe this pressure was, for the most part, productive and stimulating. What is important in doing creative work to a deadline is to establish plans, checkpoints, and administrative procedures to structure the work and to keep it under control.

Team Approach: There are so many things to consider and to do in making a MATCH Box that a team approach seemed logical at the outset and still seems appropriate. The teams did not operate, however, as we had intended.

We envisioned teams in which all members would participate in the conception and design of the Box - the Box would be a team product. Typically, however, the teams operated in a leader-consultant arrangement in which the Boxes were effectively designed by the co-leaders with assistance from key consultants.

In retrospect the leader-consultant arrangement makes sense in terms of the consultant money we had, the time commitments that consultants could make, and our own lack of experience in team dynamics and problem solving. Investing final authority in one person, the senior co-leader, has generally encouraged more swift and coherent decisions.

Though this arrangement produced successful MATCH Boxes, we are not sure that it is the best arrangement. We are still inclined toward a group process approach, but recognize certain minimal requirements for it to work: key people need to be involved for adequate amounts of time; and group process and problem solving training needs to be incorporated into the team operation.

The Status Matrix: (See Figure 2) The status matrix was used for a while during the First Generation and then abandoned. People found it cumbersome and difficult to use. While ideas were rapidly changing it became a chore to try to keep the matirx updated. No project-wide design tool of this sort was substituted, though individual teams created their own techniques for describing their Boxes and working with them symbolically.

Though the device did not work well, the matrix idea of balancing objectives, materials and activities off against each other was kept as an important design parameter.

Topic Selection: The method of selecting the Second Generation topics through a series of "defenses" had its good and bad points. It did force critical examination of a topic before manpower and funds were committed. By being a self-conscious and analytic process, it gave definition to the individual Box, and caused us to define what we meant by MATCH Boxes in general. (See the Criteria List in Appendix A) The topic defences built project-wide understanding and commitment to all of the topics, and satisfied a need to be systematic and rational about a $160,000 to $200,000 decision.

The bad features were these: It reinforced intellectualizing about topics, creating ones that "sounded" good, but sometimes were not. It may also have made it difficult for people to unhook from unworkable topics later on. A topic that had been successfully defended could be hard to abandon if the developer was impressed by the "obvious" soundness implied by the group's support, or if he felt committed to "make good" on what he had "sold" to the group.

The only way that we have thought of to protect ourselves from the tyranny of a topic is to keep the topic tentative, allowing it to take form as the Box does. In the Third Generation, this happened.

Tryouts: About 115 teachers and their classes participated in the tryouts. We were, and are, absolutely convinced of the value and necessity of making classroom tryouts part of the developmental process. In spite of this conviction, the co-leaders hesitated about getting into the classroom with their ideas. The main difficulty seems to have been that the co-leaders weren't used to creating in this fashion. Before trying something they wanted to have it well worked out. Tryouts were seen by many as a test of what they were doing, rather than as developmental method.

In time, we came to rely more and more on tryouts, particularly as our design strategies began to shift from ones that were objective-oriented, to ones that were more media and activity-oriented. Tryouts become much more relevant when you want to listen to what the children and media are saying to each other.

Tryouts, of course, take time. Hesitancy to begin them cuts into that time, so two strategies suggest themselves: first, to merge the "early development" and "tryout" stages of the development cycle into one longer and continuous developmental period which doesn't reinforce a distinction between development and tryout; and secondly, to train teams how to make the best use of tryouts.

Production: The summer production periods can only be described as wild. Hundreds of specific and detailed problems required solution. Seal oil had to be obtained from Pelly Bay, Canada; geodes from Keokuk, Iowa; geta from Japan; beaver skins from the Hudson Bay Company; soapstone from Georgia. Feathers, moccasins, records, trumpets, films, projectors, tumble weed, statues, had to be found and purchased. In the same breath Teacher's Guides were being written, edited, illustrated and produced. And meanwhile, in the Museum's workshop, media were being made: hand carved models, Greek pottery, wooden buildings, plastic paddle wheels, crystal formers, folding tables, psalteries, costumes, reeds. Packaging too was being designed - different and distinctive for each Box. Parallel production of such diverse units in small quantities allowed for very few production short cuts.

During this period there was a sharp increase in pace, numbers of people, cost, tension and accomplishment - all to be expected and not really avoidable. But we see at least two ways in which some waste and confusion could have been avoided: (1) by establishing a firm "design freeze" point beyond which further design changes would not be permitted so effort could be concentrated on executing the Box; and (2) by making plans, hiring extra people, etc., in full anticipation of the production task.

Evaluation: In all, about 330 teachers and 10,000 children evaluated MATCH Boxes. Conducting the evaluations through the school adminstration worked very well. The schools were immensely cooperative and many were eager to participate because they saw the evaluation as a way of introducing their teachers to new materials and approaches. Some systems invited us in to conduct our evaluations.

The basic form of the evaluation - obtaining daily data and a final appraisal from teachers, and reports from observers - was used throughout all generations.

We did some developmental work on the evaluation questionnaires, but not nearly as much as we wanted. (See Appendix B for the actual questionnaires.) It takes a lot of time and work to determine what questions are necessary, what measures are relevant, and then to create measuring instruments and appropriate analysis procedures. In our original plan this was to be a special staff effort apart from the Box development work. Questionnaires were to be developed and tried out in schools along with the Boxes, etc. Box development itself, however, absorbed most of the planned effort, and questionnaires and evaluation procedures were finally devised by general staff effort during the summers.

Our First Generation questionnaires were rather crude and placed too much emphasis on the teacher and her style, and upon classroom facilities.

The Second Generation questionnaires were cumbersome and long. They did, however, ask the teacher more relevant questions concerning learning, effects on the children, etc.

By the Third Generation we felt that the Boxes themselves were too different to permit use of a single questionnaire, so separate ones were devised for each Box, incorporating earlier ideas and questions, but also asking very specific questions about lessons, materials, and the approach.

There was growth of awareness and subtlety in our questionnaires, but with a properly sized and adequately professional effort there could have been more. In any future program, such an independent evaluation effort needs to be built in and carried out. Still needed are performance measures made directly with the children. We observed children and have many reports about their performance from teachers, so we have a good sense of their activity, attentiveness, and interest. It would be very nice to find out, though, what they have learned, how they personally feel about this experience, how long and how well they remember it, and what use they have put it to.

The debriefings held with teachers four to six weeks following their evaluations indicate continued student interest and recall of the MATCH Box experience. We have one tape-recorded interview with a class of retarded children who had used the Netsilik Eskimo Box nine months earlier. These children were able to recall an amazing number of factual details such as the names of Eskimos - Itimangnark, for example - and ideas about myths and ceremonial practices.

Data Analysis and Wrap-up: First Generation data was analyzed by the individual co-leaders as they prepared reports on each of the Boxes. In the Second Generation a data analyst was hired to do a generalized tabulation and grouping of the data prior to its being turned over to the co-leaders for interpretation and reporting. And in the Third Generation a similar technique was used, with the staff reducing the data.

The analysis should be planned and conducted as part of an independent evaluation program - like the one suggested above. A more extensive and penetrating analysis would have been of great value to the co-leaders in preparing their final Box reports.

F. PROJECT COSTS

The MATCH Box Project was initially planned for two years and funded in the amount of $188,000. Four Boxes were to be developed and tested in the first year, 12 more in the second year. Three prototype copies of each Box were to be made.

Early on, it became evident that the MATCH Boxes would take more time and developmental effort to produce, and that three copies of each Box were not enough for evaluation purposes, demonstrations etc. The project was therefore extended to 45 months and organized into a three-phase program, under which 9 copies of each of 16 Boxes were to be developed. The budget nearly doubled. With a series of shorter time and budget extensions the final project spanned 47 months and cost $392,513. Figure 4 shows the total budget.

Figure 4. MATCH Box Project Total Budget
(1 July 1964 - 31 May 1968)

Salaries and Wages	$207,700.
Employee Benefits	8,210.
Travel	7,500.
Materials and Supplies	69,840.
Services	10,140.
Communications	6,890.
Reproduction	8,990.
Consultants	22,020.
Direct Costs	$341,290.
15% Overhead	51,223.
Total	$392,513.

The Museum has been authorized a provisional 40% overhead rate instead of the 15% rate used on the project, which would bring the project total to about $460,000.

The budgets given to the development teams were as follows:

Materials and Supplies ($1,000 to develop the first Box and $500 ea. for 8 additional copies)	$ 5,000.
Consultants	$ 1,200.

Conclusions and New Directions

CONCLUSIONS AND NEW DIRECTIONS

Teaching and learning with a variety of real materials is an exciting, educative and personally rewarding experience for teachers as well as children. It is a different kind of teaching and learning than the usual kind that is teacher-led, and mediated by words. Children can deal with materials directly, can learn from them directly. Learning is the product of their own hand. The teacher uses materials and activities to create learning situations for the children. She can watch children at work, get to know them, and study their performance. There is a collaborative relationship between the teacher and children and among the children.

Learning of this kind is important because it enlarges the realm of subjects that can be communicated and the number of children that can be reached.

The MATCH Boxes developed by this project are a way of bringing such learning about on a large scale. They are a practical way to get richly varied materials and methods into classrooms.

The important features of MATCH Boxes seem to be these: They are designed as teaching/learning systems. They deal with subjects that have a high non-verbal content. They make use of real materials and activities. They place the responsibility for learning into the hands of the learner. They provide enough related materials to permit learning to proceed some distance. They have enough different kinds of materials to reach all kinds of children. Teachers of varying abilities can use them well. The Boxes can be successfully incorporated into many curricula. The materials are complete so that teacher and children have what they need when they want it. The units are manageable and practical in the classroom, and not too expensive. They can be used to convey content, to develop skills, and to generate self awareness and confidence.

In designing such materials, certain factors are particularly important: relating the unit to the learner and the subject to be learned; making a purposeful attempt to design a total system in which objectives, materials and activities go together meaningfully; making development the product of classroom tryouts.

New Directions:

Much more work needs to be done to further explore mediating system applications, to improve development techniques, to give a better definition to the idea. Smaller units and larger ones are possible. Many new subject matter areas, approaches, and uses need to be explored. Here are some possibilities:

Units for substitute teachers: The substitute teacher often comes into a difficult situation where maintaining order is the main business. Systems could be designed for substitutes to use for one to three days or longer. The substitute would have a program of her own. These units would combine all subjects, give the teacher a chance to get to know the class, and make a transition into the ongoing program easier if the regular teacher is out for some time.

Grade starter kits: Recalling a MATCH Box teacher who in October got to know her children as well as she usually knows them in April, it seems possible to develop a series of grade starter units, one for each grade. Such a unit would characterize the grade, act as a kick-off for the year, and enable teacher and children to get to know each other. Little brothers could look forward to the day when they start the fifth grade where "...you get to print a book." These starter units could be keynotes to the year's curriculum, and be drawn on many times during the year.

Units designed for special education: Media systems could offer a unique approach to teaching children who are experience-deprived, retarded, blind, deaf, or gifted. They could perhaps be designed for adult education programs.

Special subjects: It is very possible that certain subjects such as the Black American, or the history of the Negro in America, or urban problems could be treated directly and with impact through mediating systems.

The "Culture Box etc.": Much more work needs to be done to explore units of different functional types, such as the "Culture Box", or the Box built around a class project, or units that emphasize communication and self awareness, or that are designed to develop skills. Taking the culture unit as an example, work is needed to explore different ways of communicating a true and real sense of another culture. We need to know more about what ought to be communicated as well as how to do it. Better culture units could probably be developed if the developmental work were done on location in the other cultures.

Teacher Training: There is a lot to be done to make teaching with materials a significant approach to education. Demonstrations, workshops, in-service training courses are all possibilities. More needs to be done at the college level to train teachers how to use media in learning and also how to design them.

Media-mobile: Distribution and service are very important to the success of MATCH Box-type units. A mobile unit is a possibility for large school systems or centers which service many schools. The media-mobile could be used to distribute units, provide enroute "turnaround", and perhaps serve as a demonstration center. Mobile units could provide a media service to school systems that want to try out the materials and establish budgets before actually acquiring them.

Combinations with other media: There are many possibilities for combining real classroom materials with other media such as television programs and field trips.

Foreign relations units: These could be developed to help Americans communicate with people in other countries - be it to communicate some aspect of America, to teach a technical skill, or perhaps simply as a way to make contact and to create understanding.

Religious education: Units could be developed around religions and ethical subjects for use on a weekly basis by the lay persons who typically teach Sunday School without being professional teachers.

Research: Many areas need research. We are particularly interested in the learning value of real objects, what it is about them that affects people so strongly, and how they and words are related.